ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

What in the World!

"And," asked a utility engineer, after a lull in a conversation which had drifted into what for three years has been God's great gift to conversation, the Great Economic Dilemma, "what has happened to the much-vaunted salesmanship and sales ability of our large and small manufacturers?"

"Why," retorted the gullible editor, "isn't it on a much more solid ground than it was in the great boom days? Haven't the manufacturers scraped off the barnacles, eliminated the misfits, and aren't they going at it these days hammer and tongs to stalk the elusive order? I would expect," he continued, "that you were being pestered today by all sorts of salesmen eager to tell you in person, and with the help of bulletins, advertising matter, technical dope and price lists, what they can do for you in the way of equipment that would make unheard of improvements on your system, and all sorts of money for your company."

"I hate to disillusion you," went on the engineer without glancing at the editor's smile, "but the plain facts of the matter are that you are dead wrong. I haven't seen a real salesman in so long a time that if one were to come in I might die of heart failure and surprise."

"You mean to say——"

"Yes, I mean that most of those who are intended to do sales work have mistaken that part of their anatomy intended by nature as a temporary resting place for a permanent anchorage, with the result that they are getting bunions in the wrong places. What is even worse, those who do come in strike me as being excellent order takers, but they aren't salesmen. I find, for example, that not only have they but little conception of what is really being done on our system and of what the things are that we need, but they have slight notion of what is going on in their own shops, what they have to sell, and where and how to sell it."

"Granting that what you say is true," we urged, "the fact still remains that a great deal of this is not their own fault."

"I know, I know," went on the utility man, "that those fellows have been held down and haven't been allowed to travel, that the factory men who should act as reinforcements to them haven't been allowed to make the usual contacts, that advertising has been reduced——"

"Wait," we interrupted excitedly, delicately balancing editorial integrity against the impending visit to the Automat, "are you asking for more advertising, to tell people like yourself what is going on? Oh, mister, would you mind if we quoted you to that effect?"

"Well——"

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ELECTRICAL WORLD

Established 1883—McGraw-Hill Publishing Company, Inc.

for the Week Ending

December 9, 1933

L. W. W. MORROW, *Editor*

Recovery or Reformation?

A LITTLE STUDY of the moves of the administration that have affected electrical manufacturers and the utilities indicates that the initial aims to promote business recovery have been changed. There now is tremendous activity for reformation instead of recovery, and this has taken form largely by placing obstacles in the roads to recovery. Reformation according to preconceived ideas of sociological progress is good, but should be subordinated to recovery.

In electrical manufacturing, for example, the code has worked chiefly to increase costs. Manufacturing labor costs have increased, prices of raw materials have increased, large expenses for administering the code have been incurred and, on top of this, apparently the new construction code will increase the cost of installation and construction labor very greatly. A rough estimate of these various increases indicates that it will cost the buyer about 40 per cent more for any new installed electrical equipment in January, 1934, or later as compared to the cost in January, 1933. Inevitably these increased costs tend to narrow, and not broaden, the market and to decrease the volume of business. They work against business recovery. In return for these very tangible handicaps to recovery the electrical manufacturers have a promise of better trade practices, with a decided tendency toward governmental administration of their business.

An even more striking situation exists in the utility field. The government has actually subsidized some competing utility projects on the plea of reformation. The effect is to stifle any expansion or expenditures in the private utility business. The government destroys the investments of stockholders, the credit of the utilities and their ability to buy equipment and employ more people in construction and sales. The dollars spent by the government on a few competing projects may contribute slightly to recovery, but this destroys any possibility for spending many times this amount of money that would go into capital goods through national expenditures by one of the greatest industries in the country. It is analogous to the government subsidizing competing automobile plants to stimulate recovery in the automobile industry.

We are in hearty sympathy with altruistic ideas for industry reformation, but they should be consistent and practical and they should not take the center of the stage when business recovery is the one immediate essential to national welfare. Destruction of the credit of the utilities and an enormous increase in the cost of new electrical installations is not the way to bring back prosperity.

We agree with the administration that electric power should be inexpensive and should be in universal use. To carry out this idea, however, electrical utilities and electrical manufacturers should have every possible inducement to expand their business and to keep the price for products and service at a minimum. It is only through mass production, mass selling and low prices that the desired goals can be attained. Yet increased taxes and competing plants are saddled on the utilities and increased costs upon the manufacturers on the plea that this will bring about reformation in their business practices. Every conceivable handicap to arrival at a result stated to be desirable by the ad-

ministration has been placed upon the industry. It is high time to call a halt upon penalties and to put out some premiums to an industry whose recovery is so vital to the recovery of all business.

The cost of distribution

For several years there has been much ado about the cost of distribution in the utility business. Several attempts have been made to arrive at this cost by friends and enemies of the industry, with very little results. Wide ranges of cost, challenged assumptions, lack of detail data and the inherent complexity of the problem invalidate the effectiveness of the work done in the past. The problem is equal in complexity and difficulty in all other industries, and yet there is an insistent demand that it be solved. The public has been led to believe that the distribution aspect of business is the realm in which it is exploited.

We doubt the value of cost of distribution studies in the utility business as determining factors in making rates, especially when this cost is restricted to an inventory analysis of investment and operating costs applied to distribution facilities only. *Essentially the cost of distribution in the utility industry is the cost of doing business.* It might be arrived at in total most easily by subtracting investment and operating charges for generation and transmission, yet this lump sum would be meaningless when applied to rates for classes of customers. On the other hand, detail cost studies applied to distribution facilities are of no value for fixing rates because they neglect the enormous costs involved in doing business as a total utility enterprise. Costs determined in this manner can only serve as investment and performance guides for those concerned with distribution engineering. In any case these costs are valid only for an individual property.

Utility enterprises serve customers and collect money for this service. If any one wishes to judge one of these enterprises it is necessary to look at the over-all investment costs, operating costs and net earnings over a period of years. These data will show how much money has been made or lost and will give the information necessary for fixing rates that are reasonable and adequate. Rates are made to give the money necessary to sustain the enterprises and are not based on detail cost allocations, and cannot and should not be so based. The industrial power rate is fixed by competitive conditions, the domestic rate is placed as low as possible in order to induce usage and to please the voters of the community and the commercial light and power rate is based upon value of service very largely.

Rate making is a business with both a historical and practical background and is not a formulistic technical result arrived at by making inventories of facilities and detailed accounting analyses. Nor is it based upon some theory whereby investment and operating charges are allocated to classes of customers upon the basis of demand and consumption. This type of analysis is valuable only as a reasonable check upon conclusions reached by a more practical approach.

Employee representation

Since the coming of NRA and the more aggressive proselyting by the labor unions, interest in employee relations is increasing rapidly. In the electrical industry many utilities as well as manufacturing companies are studying the problem and the experience of the pioneers.

It is but natural that management should approach this innovation with reluctance and some fear. It clashes with the old-time traditions of authority. It seems to set up an agency for interference with established methods. But that is not the way it works out. Intelligently organized and operated, employee representation unites and vitalizes the personnel of a company in constructive planning for better co-ordination between management and labor. It leads to creative co-operation in the promotion of the inseparable interests of both. It brings harmony, not discord. It develops responsibility and leadership in the management as well as the employee group.

But the secret of success in this enterprise rests upon sincerity and a democratic spirit. Men cannot be ordered to organize. They can not be coerced into co-operation. It must be a voluntary activity that encourages initiative. If the testimony of both manufacturers and power companies is to be regarded, there is no reason to fear employee representation. The technique is well developed. Properly grounded and guided it becomes a dependable resource for defense against labor troubles.

THE WEEK

Morgan Wants Unified Valley; Utility Negotiations Proceed

"IF THE water-power development of the entire Tennessee River drainage area of 40,000 square miles can be given a single unified ownership and control, the unit cost of power may be no more than half of what it would be with divided ownership and management," A. E. Morgan, chairman of the Tennessee Valley Authority, told the New York section of the American Institute of Electrical Engineers this week. Dr. Morgan outlined his view of how several hydro generating stations participating in, to a large extent, the same river flow, but separated by many miles, might be co-ordinated and operated for maximum efficiency and best economies, contending: "I hold that such unified control and operation implies government ownership and operation. It may be argued that all this could be accomplished under private ownership and operation. But I hold that it should not be in private hands unless that should be necessary to avoid gross inefficiency and the corruption of the spoils system. The control of this great electric power system by a private corporation would give economic power over the people of the region which no self-appointed men ought to hold . . . Public regulatory bodies have not proved their ability to control such vast aggregations of economic power."

In commenting upon the situation of existing enterprise Dr. Morgan said: "Genuine effort is being made to disturb security holders as little as possible. Statements spread broadcast by the utilities themselves among the small holders of their securities . . . to the effect that if the bill (T.V.A.) should pass the utilities would be ruined, have perhaps been believed by some persons. The authority cannot, of course, be held responsible for the unfortunate results of the pessimistic forebodings of this propaganda of the private companies."

Muscle Shoals write-down

"What present conditions make for the elimination of the prospective deficit of $22,000,000 to $39,000,000 found by Major Tyler in his 1931 report," was a question asked by Philip Sporn in the forum which followed the lecture. Dr. Morgan did not consider it proper for one department of the government to comment in public on a report of some other government bureau, but he did say that to the present board "the project seems a thoroughly sound one." Also, he stated it was the policy to stipulate resale rates to be charged by contracting municipalities allowing developmental surcharges on all but residential rates. The speaker assured Graham Clayton that ample capital charges were covered by the rates announced. As for Muscle Shoals costs, T.V.A. was now inventorying that project to determine the amount to allocate to the power project. Tentatively the item for present and immediate future capacity was being set at $125 per kilowatt, although it might be fair to set it as low as some of the bids made while the government was negotiating for its disposal. Joe Wheeler Dam is being undertaken now, said Dr. Morgan, not because a demand for its output was in sight, but purely as an unemployment relief measure.

A bondholder, an unemployed engineer, asked what was going to become of bonds which, like his holding, were down to 24 cents on the dollar because they were on a Tennessee Valley property. Chairman Morgan was inclined to attribute the slump in value as much to utility broadcasting of calamity when the Norris bill was being passed. Both he and the President had received hundreds of letters from "widows and orphans" all in effect saying "all I have is in utility preferred stock." One letter showed twelve timid old ladies standing in a row in front of their old ladies' home saying in unison, "What are you doing to us?" To this the T.V.A. social empire builder rejoined, "Why did the utilities sell stocks and bonds to widows and orphans and with the proceeds build a network of plants and lines right in the shadow of Muscle Shoals when they knew that the persistence of the issue in Congress would ultimately have a successful ending for its proponents?"

New technical possibilities?

While in New York this week Dr. Morgan revealed to eager reporters that the newly operated 10,000,000-volt Van Der Graff electrostatic generator (ELECTRICAL WORLD, December 2, page 709) would be experimented with, using T.V.A. funds, because of its possibilities in connection with power transmission. Fantastic as the notion may be to engineers, the government's interests are reported centering around the development from such a source of power which may be transmitted long distances with negligible losses. Dr. Morgan said the possibilities of the colossal generator had been worked out in theory and that it now remained to apply it in practice.

Tennessee Public Service Company has written to the Knoxville City Council, reproducing the letter in full-page newspaper advertising, with the request that its distribution facilities be used for the handling of T.V.A. power voted for by the city at the general election on November 25.

T.V.A.-utility negotiations

Apparently rendered somewhat meaningless by Dr. Morgan's broad statement and concept of policy for T.V.A. and the exclusion of private enterprise from the valley, it has nevertheless been announced that negotiations are in progress between private utilities operating in the Tennessee Valley area and the Tennessee Valley Authority.

Director Lilienthal has stated that negotiations initiated two months ago, at the invitation of President Willkie of Commonwealth & Southern, which controls the Alabama Power Company, Tennessee Electric Power Company, Georgia Power Company and Mississippi Power Company, have been carried on since that time.

Among the subjects of the conferences has been the revision of the contract now in force, under which the Alabama Power Company purchases hydro-electric power from Muscle Shoals and leases the authority's steam power generating plant at Sheffield, Ala. Thus far, agreement has been reached only upon two minor matters, Mr. Lilienthal explained. The lease on the steam plant has been extended until December 31, 1933, under the same terms and conditions as provided in the War Department contract expiring December 31, 1933, pending further negotiation.

The authority has purchased a distribution line from the Tennessee Electric Power Company, near Norris Dam site, to be used in supplying electricity to the town of Norris, rather than construct a new and duplicating line. Power for this line and for dam opera-

tions is being purchased by the authority from the Tennessee Electric Power Company pending the completion of the authority's transmission line from Muscle Shoals to Norris Dam, now under construction.

▼ ▼ ▼

Edison Electric Institute Confers on NRA Code and Problems

OPEN to members and non-members alike, an Edison Electric Institute-sponsored meeting was held in St. Louis this week to discuss the permanent NRA code for the electric utility industry as well as the effects encountered thus far in operations of utilities under Presidential re-employment agreements. The tentative E.E.I. code has been in NRA hands for some time (ELECTRICAL WORLD, August 12, page 193; August 19, page 225). The gas industry met in New York at the same time. The water industry has a code pending, too. The St. Louis meeting was predominantly an operating company forum, with holding company dominance apparently lacking. More than 400 executives attended the two-day sessions.

Invoking "the common sense of the situation and the American tradition and ideal of fair play," George B. Cortelyou as president of the institute demanded that the federal government refrain from financing publicly owned utility plants. Mr. Cortelyou, who is also president of the Consolidated Gas Company and a former U.S. Secretary of the Treasury, charged that the federal government should not "repudiate its own Blue Eagle" by fostering "unfair competition."

Electric utility code

A special committee of the institute had ready for the conference a proposed code draft which was discussed freely and which with some amendments was approved for submission to Washington. Provisions of the proposed code were not available for publication at the time this issue of ELECTRICAL WORLD went to press, but it was expected that it would be filed in Washington not later than Friday of this week and be free for printing shortly thereafter. The conference was not solely an Edison Institute meeting. The institute called the meeting and the proposed code was drafted by a committee of its members, as there was no other existing organization in the industry to take such initiative. The conference was divided into three sessions, one in the morning, when the purpose of the meeting was explained; a second in the afternoon, when the code drafting committee received suggestions, and a third in the evening, when the draft was approved for filing with the National Recovery Administration.

Mr. Cortelyou's protest

"One of the declared purposes of the Act (NIRA)," said Mr. Cortelyou, "is 'to eliminate unfair competitive practices' and 'to promote the fullest possible utilization of the present productive capacity of industries,' as well as 'to rehabilitate industry' and 'to conserve natural resources.' Various of the codes approved by other industries have provided, in effect, that this should be done and that no additional and competing plants or facilities should be built or installed until the productive capacities of existing plants and facilities have been fairly utilized (taking into account reasonable reserves), to the end that duplication and waste and increased burdens in carrying charges and operating costs shall not avoidably be placed upon the public. We submit that any code now established ought fairly to recognize and require that this industry shall be accorded and assured fair and non-discriminatory treatment in this respect, as compared with other industries under the act, and that the installation of additional production and transmission capacity and facilities shall be similarly restricted, as has been done through the codes for other industries, until the existing capacities and facilities have been fully utilized.

"The elimination of unfair competition and the prohibition of increase in plant capacity until existing capacities are fully utilized have become basic and familiar provisions in the codes for other industries. Such provisions are of the essence of the declared policy of the act.

"In all fairness, we then submit these questions: In imposing a code and increased costs upon any industry, may the government itself reserve the right to violate its own standards of fair competition? May the government itself fairly continue to do, as a competitor, what it would permit no private concern in an industry to do? May even the moneys which the government takes from this industry and other taxpayers be used by the government in violating, or financing others to violate, the standards of fair competition declared in the recovery act? May the government with one hand impose a code and increased costs on an industry, and with the other destroy the possibility of compliance, through entering the field as a competitor conforming to no standards of fair rivalry and backed with all the resources of the taxing power?

"These are fair questions which deserve fair answers. They merit the careful consideration of all thinking people. If such a thing can be done today to any industry, it can be done tomorrow, or next year, to any other. The answers to these questions may be found in the code to be filed soon in Washington. The issue should be squarely faced.

"The federal government should either conform its own activities and use of federal funds to the declared policy that is fundamental in the recovery act, or it should refrain from imposing any code whatever upon an industry as to which the government proposes itself, as a competitor with the industry, to disregard the standards of fair competition. The government cannot impose on private companies a set of severe and costly requirements with which the government does not itself propose to comply, in proceeding to inflict upon the industry a ruinous competition conducted or aided by the government itself. We submit that it is no more than fair and in accord with the declared purpose of the act that if a code of fair competition is now imposed on the electric industry, no department or agency shall thereafter install additional electric generating capacity or transmission or distribution facilities in any federal project or shall advance federal funds to others for the construction or installation of any such additional capacity or facilities which would or might be operated in competition with existing capacity or facilities of members of this industry, unless and until it shall have been determined and certified after hearing by the state board or officers having jurisdiction (or by the Administrator, if no state board or officers have jurisdiction), that public necessity and convenience exists therefor, by reason of the inadequacy and insufficiency of the existing service, capacity or facilities."

Mr. Cortelyou said that if the declaration contained in the recovery act can be made effective according to its plain language, the electric industry can be placed in position to do its full part in

the nationwide program. "We welcome such a far-sighted and remedial survey of the conditions affecting the supply of electric service at reasonable rates and the stability of investments therein."

Expressing the viewpoint of the smaller utilities, A. W. Conover, vice-president Oklahoma Utilities, said that they could operate under sensible code provisions, but that regulations perfectly practicable in larger systems could not be applied to smaller ones without working great hardship. He pointed out that longer working hours in small communities had been recognized in other codes. Mr. Conover strongly urged that the leaders of the industry undertake organized and aggressive effort to combat the spread of anti-utility sentiment by officers of government. He deprecated the silence under attack that, to him, characterized the industry and said he saw no reason why the operating utilities should be punished for the sins of the holding companies.

Mullendore speaks out

W. C. Mullendore, vice-president Southern California Edison Company, told the meeting: "I challenge your attention to those governmentally financed units within the industry which under present conditions operate free from taxes, which are financed by the use of tax-free bonds issued against the public credit instead of being confined, as the privately financed utility is, to the credit of the utility enterprise itself; which charge a portion of their rent and of the services of those whom they employ against other services than that of the utility itself.

"The privately financed utility pays on the average 17 cents out of every gross dollar collected for taxes; most government utilities pay no taxes or entirely disproportionate amounts. The privately owned utilities are regulated by public agencies and under such regulations they are compelled not only to operate under restrictions from which their government competitors are free, but they are compelled to bear great burdens of expense incident to such public regulation from which their competitors are freed.

"As I have said, these governmentally financed units are allowed the use of the public credit, which means that they pledge the property of the entire nation, or an entire community, including the property of those whom they do not serve. In addition their bonds are usually tax exempt. By reason of this community credit base, and tax exemption, privileges which are denied the privately financed units, those citizens who are thus discriminated against are compelled to furnish part of the cost of a service from which they derive no benefit but which is to the advantage of others who have no greater right, under all principles of justice, than themselves. One of the most glaring examples of the use not only of the public credit, but the use of the powers of taxation to compel the support of these governmental enterprises in the utility industry is to be found in the public works section of the national recovery act itself, wherein a tax is imposed on the capital stock, the dividends and profits of the privately financed utilities, as well as other corporations, in order to finance the loans and gifts made by the P.W.A. Millions of dollars thus derived from the private utilities are made available for the financing of competing units within the industry, some of which are municipalities to which an outright donation or gift of 30 per cent of the capital necessary for competition with private utilities is made. In other words, here is a concrete example of a direct exaction through taxation from the capital and income of private utilities for the direct benefit of competitors who are to be set up for operation upon a much more favorable basis than is permitted to those who have furnished the money for their operation.

"Finally, I again say that in demanding the elimination of unfair competition, we ask that the test of our proposal shall be the public interest and the public welfare.

"All who believe in the square deal, all who believe in the fair treatment of the plain citizen who has played the game fairly according to the rules, all who decry the sacrifice and destruction of the savings of the people, all who deplore the destruction of faith and the discouragement of the homely virtues which have builded America and made it great, will join in this plea for fair and honest treatment."

After statement in the evening meeting of suggestions for revision of the draft accepted by the code committee during the afternoon, L. H. Egan proposed resolutions to the effect that the conference approves the draft in substance and principle and authorizes the code committee to present it to the National Recovery Administration, that three more members be added to the code committee specifically to represent electric utilities that do not belong to the Edison Electric Institute and that until a permanent agency is constituted the code committee shall act as enforcement authority under the code when accepted. The present membership of the committee, to which the above stated three new members are to be added, consists of P. S. Arkwright, chairman; James A. Simpson, John E. Zimmermann, Sidney Hosmer, W. J. Hagenah, F. M. Tait, G. O. Muhlfeld, C. E. Groesbeck and A. F. Hockenbeamer.

— And Prohibition Is Over

Perhaps it is but the breath of Christmas in the air, perhaps the realization that many a sick man has regained health in spite of his physicians, perhaps weariness with destructive reform influences, but there is, nevertheless, a far better impression about business and its prospects to be sensed than has existed for some weeks. The stock market has rallied from its lethargy and accepted the bull side. A growing tendency to ignore dollar-wrecking on the basis that nothing truly significant in any inflationary way could be accomplished without further Congressional action is felt. The long-time view appears to be gaining ascendency over short-time fears.

Figures of the week, badly distorted by holiday and pre-holiday influences, are inconclusive. Energy production shows little change from its previous relationship to foregoing years. Bituminous coal production and carloadings off slightly. Steel output rising as activities touch a 28 per cent basis. Commodity prices rise. Weakness in high-grade bonds resumed.

Out of the ticklish electrical utility code situation arises a promise of one of NRA's hardest fights with important issues at stake. The Edison Electric Institute-sponsored all-industry meeting at St. Louis this week was no tea party and ructions within and without the industry would appear imminent. For other fireworks over NRA one has only to wait until Congress meets.

McGraw Awards Made to Electrical Men

Presentation of medals and purses to the recipients of the 1933 James H. McGraw awards for electrical men were made this week. Recognition of co-operative efforts within the industry and for contractor-dealers were involved.

To Charles E. Michel, sales manager of the Union Electric Light & Power Company, and Jack E. North, president of the Electrical League of Cleveland, went awards for co-operation (Mr. North will receive his next week).

To Gerry M. Sanborn, president of the Sanborn Electric Company, Indianapolis, went the contractor-dealer award.

Previous recipients of the award for co-operation have been J. Robert Crouse, W. Winans Freeman, H. H. Courtright, C. T. Hutchinson, T. R. Beal and H. P. Liversidge.

Previous recipients of the contractor-dealer award have been L. K. Comstock, J. A. Fowler, N. J. Biddle, J. A. Kuhlemeyer, L. Kalischer, and G. D. Munger.

Coming Meetings

American Physical Society, Pacific Coast Meeting—Stanford University, Calif., December 15-16. W. L. Severinghaus, Columbia University, New York.

American Institute of Electrical Engineers—New York, N. Y., January 23-26. H. H. Henline, 29 West 39th St., New York.

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New York Commission Has New Accounting Plan Ready

In preparation for nearly a year and a half and under active discussion for about half that time the New York Public Service Commission's new uniform system of accounts for use by utility companies of that state will be made effective January 1, 1934.

In explaining the new system the Public Service Commission has characterized it to be "one of the most important advances in regulation in this state in several years."

"Under the newly prescribed systems," the commission announces, "the companies will be required to keep their accounts in a manner that will enable the consuming public and stockholders to know readily the true condition of the properties of the various operating utilities in the State, and furthermore they will greatly aid the commission in determining the fair value of property for rate-making purposes and also expedite the handling of applications for additional capitalization."

Changes in accounts

The new systems of accounts require that accounts for operating property, previously carried as fixed capital, shall be carried at original cost; and when the books do not reflect this original cost, it is required that they be adjusted to do so.

It is further provided that all classes of utilities use the "straightline" method of ascertaining the annual rate of depreciation—a method briefly described as requiring the writing off of the original cost of operating property in equal monthly instalments during the life of the property, with allowance for salvage and removal. The commission pointed out that the systems previously in effect allowed the companies to determine for themselves the amount to be set up annually for retirement expenses.

Another feature of the new accounting systems, to which the corporations objected on the ground that operating expense would be increased, was the prescription of a continuing plant record similar to the perpetual inventories ordinarily kept by industrial corporations. The continuing plant record will show property added and retired, at the original cost.

Under the new systems of accounting, there is a much more detailed segregation of both property and expenses between transmission and distribution functions than was required heretofore; in addition, property, revenues and expenses are segregated in each production plant; there is no provision for carrying the "general overheads" in separate accounts, but all expenses of this nature are required to be related to particular classes of property and included in such accounts.

The new systems also require more detailed accounting for transactions with affiliated companies and a greater segregation of such accounts and transactions from those with others.

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Oklahoma Commission Plans Resumption of Activities

When the state Supreme Court hands down the mandate in the mandamus case brought against the state auditor by various commission employees supposed to be paid from the $50,000 annually appropriated fund for investigation of public utilities in rate cases the state Corporation Commission will resume its program for general electric and telephone rate investigations, according to Chairman Paul A. Walker of the commission.

The Supreme Court has held that the commission, empowered by law to investigate utilities, can employ experts and other workers needed in the investigation work and pay them from the $50,000 fund, despite the fact that Governor Murray has forbidden expenditures from the fund for this fiscal year. The Supreme Court ruled invalid the provision in the appropriations bill that expenditures from the special $50,000 annual utility investigation fund must be approved by the Governor.

When the mandate comes down issuing the writ of mandamus to force the state auditor to pay salaries of commission employees working in the utility investigating, accounting and engineering departments some employees will get their pay for the first time in four months. The case has been in litigation since early in August, when the state auditor turned down salary claims.

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Harvey Couch Has His Day

Climaxing a community fête "Harvey Couch Day" in his honor citizens of Pine Bluff, Ark., have presented to Harvey C. Couch, president Arkansas Power & Light Company and director Reconstruction Finance Corporation, a silver plaque inscribed: "Presented to Harvey C. Couch by the people in recognition of his services to his city, his state and his nation in the fields of education, industry and economics, Pine Bluff, Ark., November 23, 1933."

Missouri Valley Meetings Tackle Low-Use Customers

In a series of three meetings utility men of Iowa, Nebraska, Kansas and Missouri have been considering methods of developing the "below-average" customer. Approximately 90 per cent of the utilities in those four states were represented at the conferences held under the sponsorship of the Missouri Valley Electric Association.

In the discussion of the Better Light, Better Sight campaign, possibilities of load building and revenue building, it was brought out that a relatively low percentage of the total business in lighting represents a much higher percentage of the total revenue. It was also shown that many utilities have not thoroughly informed their employees concerning the importance of good lighting and likewise they have failed to sell their employees the valuable additional foot-candles of intensity.

S. F. L. Snyder, merchandise manager of the Union Electric Light & Power Company, explained in detail the company's new campaign in which it is stressing the lowest residence rate in the United States. A plan of co-operation with contractors and dealers, using newspaper advertising, billboards and the radio, was described. A series of 100 advertisements over dealers and contractors' names will be published and 200 billboards will be used.

E. M. Howe, range sales supervisor of the Kansas City Power & Light Company, explained the new range rental plan of his company wherein ranges are rented on a five-year plan. At the end of five years the customer owns the range. At any time before the expiration of five years the customer may pay the balance of the five-year rental and acquire title. Two sizes, the three-hole 14 in. and the four-hole 16 in., are rented, the company doing the maintenance during the rental period.

A. Freund of the Union Electric Light & Power Company of St. Louis opened the discussion on air conditioning and gave the following comparative figures for his city:

Installations Prior to 1933		Installations 1933 to Nov. 1	
Residential	24	Residential	32
Offices	19	Offices	20
Retail stores	8	Retail stores	6
Restaurants	5	Shoe repair shops	3
Theaters	7		
Total prior to 1933	63	Total 1933 to date	61

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Sunlight Vapor Lamp?

At the meeting in Cincinnati this week of the American Physical Society I. A. Balinkin and D. A. Wells of the University of Cincinnati demonstrated a new mercury lamp of the gaseous discharge type. By adding one-five-hundredths part of the rare metal ru-

bidium to the mercury, red rays are introduced to the mercury spectrum in sufficient quantity to make the new light closely approximate sunlight. This lamp can be used in home lighting with 110 volts and is said to have a life ten times as long as that of ordinary incandescent lamps.

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Louisville Ruling Contested; Rehearing to Be Sought

Vigorously branding as "absolutely misleading in a number of important particulars" the "impression given by reports of the decision of the Federal Power Commission in determining the valuation base of the Louisville hydro-electric plant (ELECTRICAL WORLD, December 2, page 709) John J. O'Brien, president Standard Gas & Electric Company and its wholly owned subsidiary, Byllesby Engineering & Management Corporation, has indicated that a rehearing of the case will be sought.

"There has been no simple transfer of funds from one part of the Byllesby structure to another," states Mr. O'Brien, "and all charges rendered have been for services actually performed in ample measure and with economy to the operating companies.

"In the Louisville case the entire amount of compensation for engineering and construction supervisory service actually performed, or $481,000, has been disallowed by the commission, but it is noticeable that in rejecting the amount the commission does so with leave to submit appropriate evidence in support of the claim. The decision itself points out the complete and many services rendered by the Byllesby Engineering & Management Corporation, for which compensation is claimed on the basis of 7½ per cent of the actual cost of construction. Such a basis for similar services has long been recognized as reasonable and fair.

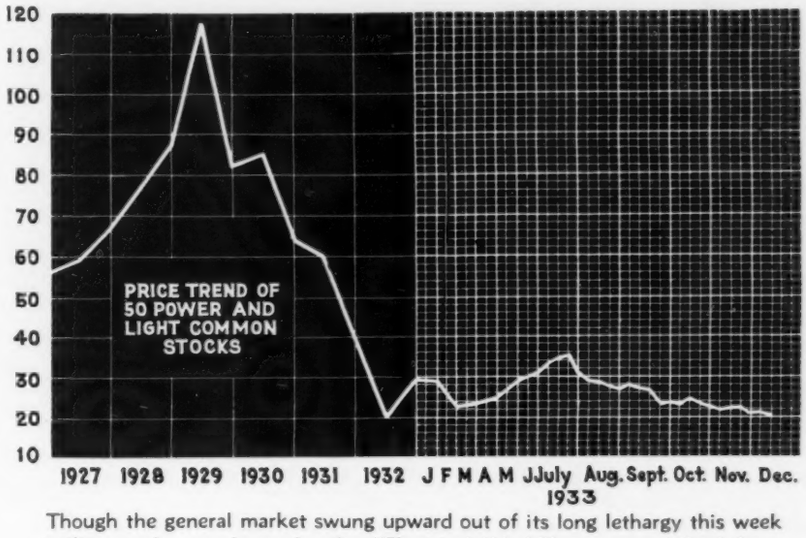
"The Louisville hydro-electric project consists of an 80,000-hp. power house, placed in operation in 1928, and a dam in the Ohio River, the dam being owned by the federal government. Both dam and power house were built by the Byllesby Engineering & Management Corporation as engineer and supervisor of construction. In order to keep down the cost of the entire project it was generally agreed that construction of both parts of the undertaking should be unified. The engineering corporation was the lowest of three bidders for the construction of the government dam, or about $187,000 under the next lowest bidder. As a result the engineering corporation had charge of the entire project, the total cost of which was about $10,000,000.

"The charges to the operating company for engineering and supervisory services on the power plant were for services actually performed, the work done covering complete engineering services including preliminary studies, designing of hydraulic, electrical and structural features, and also the entire organization and supervision of construction. The job was handled without the assistance of other engineers or sub-contractors. Construction extended over a period of more than two years and required the maximum employment of 1,500 men.

"These engineering and supervisory services had to be performed by some specialized organization. The operating company could not provide them. Our contention is that the compensation claimed is much lower than the cost would have been if these services had been obtained from any source other than the Byllesby Engineering & Management Corporation. The competency and experience of the engineering corporation has not been questioned. That the services were actually rendered apparently is not disputed.

"I am confident that a complete and impartial study of the facts will reveal neither injustice to the public or the operating company, but to the contrary will show the operations under scrutiny were performed efficiently and economically, and that the claims made are fully warranted by the underlying facts and conditions."

Decline Continues in Utility Stocks



Though the general market swung upward out of its long lethargy this week utility stocks, as shown by the "Electrical World" average, drifted fractionally lower to 21.2 from 21.4 last week.

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Martin Insull Loses; Samuel Insull May Too

If the ruling late last week of Justice A. C. Kingstone of the Ontario Supreme Court sustains the further assaults of Martin Insull's attorneys the refugee utility man may soon be back in Chicago. Justice Kingstone has granted the extradition request of Chicago authorities. Insull's counsel immediately applied for a writ of *habeas corpus*.

Reports from Greece state that the government there will not renew Samuel Insull's permission to reside in Greece when the present dispensation expires on December 31. Cancellation is reported to have been at the request of United States authorities after extradition efforts twice failed.

Judge S. H. West of the United States District Court in Cleveland, in a decision in the suit brought by the Penn Central Light & Power Company against the Reserve Power & Light Company, has ordered payment of a defaulted note for $617,917, with interest of 6 per cent from January 31, 1933, and with costs. As $28,000 had been paid in 1932 on the note, the face amount of the claim was $589,917. The defendant company is expected to take the case to the United States Circuit Court of Appeals. Both concerns were among the Insull properties.

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West Central Public Service

Federal Judge Donohue has appointed Charles F. McLaughlin, Omaha attorney, receiver for the West Central Public Service Company. Mr. McLaughlin has power to act for the company in Nebraska, North Dakota, South Dakota, Minnesota and Iowa.

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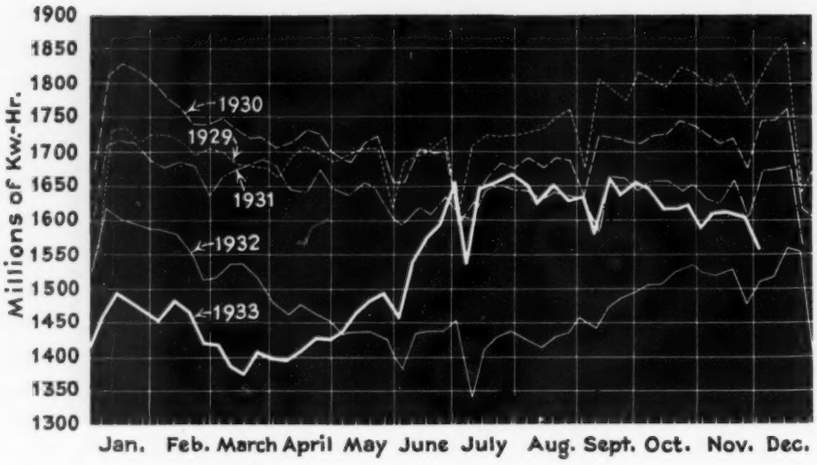
Tokyo Electric Bonds

Tokyo Electric Light Company has canceled the provision of its debentures which permits holders to receive dollars or sterling at the former gold exchange rate.

Output Holds Lead Over 1932



With an output of 1,553,744,000 kw.-hr. during the week ended December 2, according to the Edison Electric Institute, central-station energy production for the two-week period including Thanksgiving Day exceeded last year's by 5.9 per cent. It fell 3.4 per cent short of the corresponding figure for 1931. Compared with both the week of November 18 and the five-week average the percentage shows a slight increase. No comparisons are made for the individual weeks because of the shift in the holiday.

Accelerated progress appears in the Mountain States, now 30.3 per cent over 1932. On the Coast the lead also increased. The South is again catching up. Other sections held, or receded moderately.

Weekly Output, Millions of Kw.-Hr.

1933	1932	1931
Dec. 5...1,554	Dec. 3...1,510	Dec. 5...1,671
Nov. 25...1,608	Nov. 26...1,475	Nov. 28...1,600
Nov. 18...1,617	Nov. 19...1,532	Nov. 21...1,655
Nov. 11...1,617	Nov. 12...1,521	Nov. 14...1,623
Nov. 4...1,583	Nov. 5...1,525	Nov. 7...1,628

Per Cent Change from Previous Year

Region	2 Wks Dec. 2	Week ended Nov. 25	Week ended Nov. 18
New England	+ 6.8	*	+ 8.4
Middle Atlantic	+ 3.0	*	+ 4.6
Central Industrial	+ 8.9	*	+ 8.7
West Central	+ 0.5	*	+ 1.9
Southern States	— 0.4	*	— 3.9
Rocky Mountain	+30.3	*	+26.6
Pacific Coast	+ 4.7	*	+ 3.0
United States	+ 5.9	*	+ 5.6

*No percentages available due to Thanksgiving holiday in 1932 week.

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Trade Commission Hears of Utility Loans to Papers

Sharply contradicting those statements allegedly made before the Federal Trade Commission regarding loans made to newspaper publishing companies by subsidiaries of Samuel Insull's various companies, Morse DellPlain, president of Northern Indiana Public Service, has denied that his company had any financial interest in any newspaper in the 210 communities it serves. He likewise denied the company to have made loans to two Indiana newspapers. The utilities president said he regarded newspaper advertising as vital to business.

"The statement has been made that the company loaned $4,000 to the Lake County Publishing Company, publisher of the Hammond *Times*," he said. "This statement is not correct. The sum of $4,000 was advanced to the publishing company in May, 1931, as a prepayment of advertising charges. At the end of 1931 the utility still had advertising in the amount of $1,461 to its credit. In September, 1932, advertising in that amount had been used and there have been no further advance payments.

"Regarding the statement that Northern Indiana held shares of the Pilot Publishing Company at Plymouth, Ind., the company at no time bought any stock in this newspaper. When the company bought the Plymouth Lighting Company, nearly ten years ago, its assets included five shares of the Pilot Publishing Company. These shares had been bought in 1920 by C. D. Snoberger, former owner of the utility. The stock was redeemed by the publishing company in 1929 at the purchase price."

Evidence presented before the commission indicated that many of the alleged "loans" had been repaid, specifically those of the Central Power & Light and Southwestern Gas & Electric companies.

After the hearing held last week covering the affairs of the Northern New York Utilities Company, Inc., the commission hinted it might recommend the establishment of a definite rule for public utilities companies to follow in carrying on their books the assessments against them for benefits under New York State's river-regulating plan. Northern New York Utilities Company charged its assessments to electric fixed capital; the alternative is to charge to operating expenses. These charges were the company's share of the cost of increasing the capacity of the Stillwater reservoir, on the Beaver River, to more than 4,000,000,000 gal. in 1924. It was testified that in the case of Northern New York Utilities a change in method would have made a difference of only one-hundredth of 1 per cent in the rate of return on fixed capital. Robert E. Healy, general counsel to the commission, who conducted the inquiry, replied that he nevertheless felt it was the commission's duty to point to the problem and to indicate the difficulties of deciding it, in view of the fact that no decision ever had been given in New York.

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U. S. Survey Reports Lower Daily Output

Electrical energy production by public utility plants during October amounted to 7,490,000,000 kw.-hr., according to the U. S. Geological Survey. This includes railway, public works and various other classes of plants contributing energy for public use, in addition to central electric light and power stations.

The total was 142,000,000 kw.-hr. more than in September, but average daily output was 1.3 per cent less. The normal change at this time of year is an increase of about 1.5 per cent. The excess over last year was 6 per cent against 9 per cent in September and more during summer. Prior to May the monthly production was less than in 1932.

Production from water power dropped to 35 per cent of the total, compared with 40 per cent in September. For the first time in half a year it was less than in 1932.

Per Cent Increase Over 1932

Region	September	October
New England	+ 8	+10
Middle Atlantic	+ 3	+ 2
East North Central	+14	+ 8
West North Central	+ 4	+ 2
South Atlantic	+20	+ 6
East South Central	+ 6	+ 2
West South Central	+ 8	+ 8
Mountain	+25	+28
Pacific	+ 3	+ 5
United States	+ 9	+ 6

Regional gains over last year were largest in the Mountain states and New England, where they were also larger than in the preceding month, but in the majority of cases they were smaller, as appears from the table.

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Los Angeles-Sierras Deal

Approval of the California Railroad Commission has been sought for an agreement to transfer certain properties of the Southern Sierras Power Company to the city of Los Angeles. The price is given as something more than $2,000,000.

New York Metal Prices

	Nov. 28, 1933 Cents per Pound	Dec. 5, 1933 Cents per Pound
Copper, electrolytic	8.25	8.00
Lead, Am. S. & R. price	4.30	4.15
Antimony	7.25	7.25
Nickel ingot	35.00	35.00
Zinc, spot	4.85	4.85
Tin, Straits	52.25	53.00
Aluminum, 99 per cent.	23.30	23.30

P.W.A. Funds Reduced; More Applications Up

But $150,000,000 of the $3,300,000,000 Public Works Administration fund remains, Secretary Ickes told President Roosevelt last week. Only that relatively small amount is free of allocation to and for specific projects. Additional appropriations will be necessary for projects which will take two or three years to complete.

P.W.A. funds sought

Fredericktown, Mo., has applied to the Federal Public Works Administration for a $32,458 grant and $100,067 loan for a municipal plant to cost $132,525.

Owensville, Mo. has filed application for a P.W.A. grant of $21,200 and loan of $67,800 for a city light plant.

Trenton, Mo., has asked P.W.A. for a $74,560 grant, $240,540 loan.

Van Buren Light, Power & Ice Company (Mo.) seeks $40,000 loan on electric distribution system to cost that amount.

Licking, Mo., for a city light and water system seeks $20,324 grant and $52,534 loan.

Monett, Mo., wants $148,505 for municipal power and light facilities.

Covington, Va., is unofficially reported to have asked between $300,000 and $400,000 for a municipal plant.

P.W.A. funds advanced

Lawler, Iowa, has received a P.W.A. grant of $1,400 for a municipal plant.

Sheffield, Ala., received $230,000 for power project using Muscle Shoals energy.

Tuscumbia, Ala., will receive $130,000 from P.W.A. for Muscle Shoals power distribution.

Thief River Falls, Minn., obtained $15,000 for power and waterworks project.

Chanute, Kan., will renovize its electric power plant with a P.W.A. grant of $25,000.

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Alabama Decision Appealed

Alabama Power Company has formally appealed to the state Supreme Court from a $178,000 judgment granted Bosworth Smith & Company, bridge contractors, by a lower court, growing out of the destruction of a cofferdam, a barge, tools, equipment and material used by the concern in the construction of a bridge pier. The loss was allegedly due to the release of a large volume of water from a hydro-electric dam located above the bridge site. The utility contends that it was under no obligation to give the contractors notice of any steps in the normal operation of the dam.

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Nebraska Rehearing Sought in Ainsworth Diesel Case

Motion for rehearing of the case of the Interstate Power Company vs. City of Ainsworth has been filed with the Nebraska Supreme Court. It is claimed by the city's attorneys that the decision that revenue-bearing warrants payable out of future net earnings cannot be issued to pay for the construction of a municipal lighting plant (ELECTRICAL WORLD, November 11, page 617) practically ends all attempts to build such plants in competition with existing private power plants. They contend that it strips all Nebraska municipalities of the right to finance such construction by "a sensible method, which has the hearty and almost universal approval of taxpayers because it makes unnecessary such financing by tax levies or bond issue; that in effect it closes every door in the state by which a municipality may engage in such an enterprise, not only because in these times the people will not vote bonds or approve tax levies for such purposes, but that in nearly every case the limitation on levies and bond issues, taken in connection with existing indebtedness, would not permit construction of an adequate plant, and that the decision jeopardizes the applications of municipalities to the federal emergency administration of public works for loans and grants for the building of self-liquidating municipal projects."

Former Attorney-General Sorensen, Norris lieutenant and head of the state public power league, had been added to the list of attorneys for the city. He says that he prepared most of these applications for grants and loans on the strength of the decision in Carr vs. Fenstermacher (which upheld the right of a municipality to issue such revenue warrants retirable out of future earnings); that that decision has become the Bible of municipal authorities, and that its repudiation by its authors has plunged those relying upon his advice into a "legal hell." The court intimated in its opinion that the city had obligated itself to pay too much for its power plant, and Attorney Sorensen argues that it should not make bad law to relieve a city from a contract the court may deem unwise.

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Lynchburg Abandonment

Petition of the Chesapeake & Ohio Railway and Appalachian Electric Power companies for permission to abandon the James River and Kanawha canal property at Lynchburg, Va., has been granted by the state Corporation Commission. The petition was vigorously opposed by the city and industrial interests when the case was heard several years ago.

Major New Construction This Week

Columbia Railway & Navigation Company, Columbia, S. C., plans hydro-electric plant on Cooper River, near Pinopolis, S. C., with ultimate capacity of 200,000 hp., and construction of transmission lines, substations and distribution system. Includes development of Santee and Cooper Rivers for navigation. Application made for federal loan of $34,000,000.

Hamburg Brewing Company, Wonewoc, Wis., to build $100,000 plant.

Motors, controls, conveyors, etc., will be installed at Tarrytown, N. Y., plant of General Motors Corporation at a cost of over $150,000.

Loup River Public Power District, Columbus, Neb., plans installation of three 16,500-hp. water turbo-generator units at hydro-electric power plant on Loup River, near Columbus, and two 4,500-hp. water turbo-generators in similar plant on same river, near Monroe, Neb., also transmission lines. Federal loan and grant of $7,300,000 has been secured.

Power substation equipment, heavy-duty motors, pumping machinery, conveyors, etc., will be installed in new soda and soda ash plant at Lake Charles, La., of Mathieson Alkali Company. A $5,000,000 project.

Until December 20, bids will be received by Bureau of Yards and Docks, Navy Department, Washington, D. C., for complete electric light and power distribution system at Quantico, Va. (Specification 7527).

Motors, controls, regulators, conveyors, etc., will be installed in paper box manufacturing plant of Matthews Brothers, Baltimore, Md. Cost over $150,000.

McPherson, Kan., plans early call for bids for Diesel engine-generators and auxiliary equipment for city-owned electric light and power plant. Financing for $200,000 being arranged.

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St. Lawrence Treaty Hit

Denouncing the pending St. Lawrence River development treaty with Canada as "strangulation of the Mississippi Valley," Senator Clark of Missouri last week further characterized the project as "a menace to the welfare of the whole people of the United States."

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Electric Public Utilities

Under orders from the Court of Chancery in Wilmington, Del., receivers for the Electric Public Utilities Company, with claims outstanding of $7,500,000 against the remaining assets of the organization, have been given until February 1, 1934, to dispose of the company's assets at public sale to the highest bidder.

As to Rates——

• Public Service Electric & Gas Company witnesses were cross-examined in the electric rate case before the New Jersey Public Utilities Commission last week by counsel for petitioners with a shift from salaries (ELECTRICAL WORLD, November 18, page 650) to various items of expense, advertising and fees paid for construction work. John A. Matthews, associate counsel for the petitioners, developed that the electric department last year paid $462,893.71 in fees to United Engineers & Constructors, Inc., for work done for the electric department. The total cost of work was $5,875,154. Upon being interrogated by Mr. Matthews, Franklyn Heydecke, general auditor of the company, testified that approximately $231,000 probably was paid for advertising annually. Mr. Heydecke said he did not believe $34,000 paid in dues to the National Electric Light Association, $17,298 paid to the Edison Electric Institute and other trade organizations and sums to chambers of commerce and civic organizations should be considered as advertising. In 1932 Mr. Heydecke testified that 102 employees of the electric department received salaries of between $5,000 and $10,000; ten received between $10,000 and $15,000; eight between $15,000 and $20,000 and four $20,000 or more. This year the number of such employees had been reduced to 95, as follows: Seventy-eight between $5,000 and $10,000, eleven between $10,000 and $15,000, four between $15,000 and $20,000 and two more than $20,000.

• More than 250 different kinds of public utility rates on electricity were in effect in Indiana when the present public service commission began its duties in March this year, according to Perry McCart, chairman of the commission. Much of the time of the commission during the past months has been given to simplifying rate structures, with the result that the number has been reduced to approximately 150, which the commission holds still is too many.

• Indiana & Michigan Power Company and the Michigan Public Utilities Commission have reached an agreement in their negotiations for reduction of electric rates in the southwestern Michigan territory served by the company. The company recently agreed to cut its rates in incorporated cities and villages by approximately $175,000 a year. The commission has persuaded the company, in addition, to grant a corresponding reduction to about 6,500 customers outside incorporated communities.

• Missouri Power & Light Company's new schedule of electric rates for 150 towns in northern and central Missouri has been approved by the state Public Service Commission. The new rates, effective January 1, 1934, were agreed upon after a series of conferences inaugurated by the commission with representatives of the utility. Savings will range from 6 per cent to 30 per cent and will amount to approximately $180,000. In general the new schedules will reduce the first step of the domestic rate schedules in all communities, lower the second step in some of the smaller towns, reduce minimum rates in certain territories and make adjustments in domestic and commercial schedules which will mean a saving to all consumers and communities served by the utility company. The commission evaluated the company at $9,964,149 for rate determining purposes.

• Arizona Edison Company's interlocutory injunction hearing to restrain the Arizona state Corporation Commission from placing in effect reduced power rates in Yuma has been extended from November 27 to January 2 in the United States District Court at Phoenix. An order temporarily restraining the Corporation Commission from placing the new rates in effect was issued by Judge Fred C. Jacobs on November 17.

• Public Service Company of Northern Illinois counsel at the rate hearings resumed last week attempted to break down the direct testimony of expert witnesses hired by the Illinois Commerce Commission and establish the fact that instead of having enjoyed earnings of 9.57 per cent the amount was approximately 7 per cent. Dr. William A. Dittmer, associate of Mark Wolf, statistical experts, was again subjected to cross-examination by Attorney Harry J. Dunbaugh, of counsel for the company. Attorney Dunbaugh sought to have the witness admit there had been important discrepancies in the listing of revenue-bearing properties and that if these discrepancies were adjusted there would be a far different picture before the commission than presented by Dittmer and Wolf in their direct testimony. Item after item was taken up by the company lawyer and efforts made to induce the witness to make admissions that would establish a rate of return of approximately 7 per cent rather than one of 9.57. The latter is declared by lawyers for the commission to be $29,371,913 in excess of a reasonable 6 per cent profit between 1923 and 1932.

• Indiana Public Service Commission has invited sixteen towns having wholesale electric rate reduction petitions pending before it to participate in presentation of evidence in the case of the Public Service Company of Indiana, which faces a rate fight following the commission's finding that present rates are not justified. Sherman Minton, public counselor for the commission, inaugurated the action. Minton charged the company is making in excess of $1,500,000 over and above a fair return on a fair "used and useful" valuation. At the preliminary hearing the company sought to prove a $50,000,000 valuation. Towns asked to participate at the hearing all purchase electricity from the company at what is known as "gateway prices" and own their own distribution systems.

• Northwestern Electric and affiliated companies' rate discussion was recently resumed when statements by Paul B. McKee, president of the company, that since the 1913 rates of utilities have been closely regulated by the state Public Service Commission and that utilities had never been permitted to make excessive profits were characterized as "entirely out of line with the facts" by Charles M. Thomas, Oregon public utility commissioner. Mr. Thomas declared that not one of the utilities headed by Mr. McKee had ever had a valuation fixed and that they had paid $5,738,038 in dividends on $18,890,730 of watered stock. He also charged that the companies had paid a total of $3,646,727 to Eastern holding companies. "These astounding and amazing statements," Mr. Thomas said, "coming from Mr. McKee clearly disclose the real difference between himself as president of the Electric Bond & Share group in Oregon and myself as public utilities commissioner."

• Toledo Edison Company has announced its willingness to reduce rates substantially in Defiance. The proposed slash would result in first 50 kw.-hr. at 6 cents, next 50 at 4 cents and all over 100 at 3 cents, retaining the present 75-cent minimum.

• Detroit Edison rate decision by Judge Leland W. Carr in Circuit Court at Lansing, Mich., is interpreted as meaning the case will be heard on its merits in the Ingham County Circuit Court. A cut in rates of $1,500,000 was ordered by the Michigan Public Utilities Commission. The Edison company appealed by filing a bill of complaint charging the commission could order rate schedule changes only, and not a blanket cut. The Michigan Manufacturers Association then filed a bill charging the cut was not enough and asking that it be ruled ineffective. The Attorney-General's office filed a motion to dismiss the association's suit, seeking a decision on jurisdiction before preparing the rate case. Judge Carr dismissed the plea for dismissal, holding that the case may be tried in a court of equity.

• Georgia Power Company's electric power rates for domestic customers, ordered cut by the state Public Service Commission last week, were immediately accepted by the power company. The domestic rates are slashed from as much as 40 per cent in the lower brackets down to 3 per cent in the upper brackets. It was estimated that the domestic reductions, together with those

for commercial customers not yet announced, will cost the company between $825,000 and $850,000 annually. The reductions will go into effect with meter readings on and after January 1, making them applicable for December. The new schedule of rates prescribes a minimum bill of $1, which will carry with it up to and including 15 kw.-hr. of current, thereby reducing the bills of 15 kw.-hr. customers from $1.60 to $1. For users of more than 15 kw.-hr. the rate is 7.22 cents per kilowatt-hour gross or 6.5 cents net, with 5.55 cents gross or 5 cents net for the next 35 kw.-hr., 3.33 gross or 3 cents net for the next 140 kw.-hr. and all over 200 kw.-hr. 1.66 gross or 1.5 cents net. The commission published a new schedule of commercial electric power rates designed to save customers approximately $170,000 a year, but withdrew the order for revision before it was served on the company.

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Municipal Items

LONG BEACH, CALIF.—Voters at a special election held November 21 refused to sanction the proposed withdrawal of the city from the Metropolitan Water District of Southern California. The vote was 14,989 against withdrawal and 11,382 favoring withdrawal.

AUGUSTA, GA.—City Council has authorized the Augusta Canal Commission to proceed with the necessary steps for the electrification of the Augusta Canal. Two ordinances recently adopted by Council have cleared the way for the construction of a $2,500,000 hydroelectric plant and standby steam plant.

CHESTER, ILL.—An election will be held January 3 on the proposal for the city to issue $158,000 in utility certificates to finance the construction and equipping of a municipal light and power plant. The W. A. Fuller Company, St. Louis, Mo., is the engineering firm in charge of plans for the plant.

CARUTHERSVILLE, MO. — Following the veto of Mayor W. D. Byrd, City Council, in special session, canceled plans for a municipal light plant election (ELECTRICAL WORLD, November 18, page 651). The date had been tentatively set for December 12 and would have been the third such election. The Arkansas-Missouri Power Company, which serves Caruthersville, recently went into receivership.

FORT WORTH, TEX.—Estimates on a proposed municipal power plant, which would cost probably $2,170,000 to build, and show a possible annual profit of $410,828, have been submitted to the City Council by the city engineer. The first estimate calls for a plant to supply power for the Holly water pumping station, which would cost $244,264; the second calls for one to supply current to all water plants in the city and the school system, and would cost $834,231. The third would be a plant to supply certain commercial districts, costing $2,114,202. The final set of plans calls for a plant that would include a substation supplying current for the sewage disposal plant. The report states that operating costs for the entire plant would be $434,056 a year and that the revenue would amount to $844,884, or a profit of $410,828. This, it is estimated, would mean a return of 18.93 per cent on the investment and would make possible a tax reduction of 23 cents on the $100. City Manager George Fairtrace, who is in Washington attending a civil works administration conference, will present plans for a power plant that would cost $4,000,000.

OLYMPIA, WASH.—Provision in the state's new business tax law imposing a 3 per cent tax on the gross revenue of municipally owned utilities has been held to be constitutional in a decision written by Judge D. F. Wright of the Thurston County Superior Court. The decision denied the city of Tacoma an order restraining the state Tax Commission from collecting the tax on the gross revenue of the city's municipal power system. The cities of Yakima, Walla Walla, Spokane, Seattle, Bellingham, Bremerton and Aberdeen had joined Tacoma in the suit. Judge Wright, in sustaining the Tax Commission's demurrer, indicated, however, that the state could not collect the tax if the utility would be impaired in paying its bondholders.

JASPER, ALA.—Citizens have voted 480 to 382 against municipal operation of light and power plant.

O'FALLON, ILL.—Proposal for construction of municipally owned electric light and power plant was adopted by a vote of 621 to 416 on November 29. The vote authorized issuance of $145,000 in bonds to finance construction in case the city does not receive that amount in a public works loan. Such a loan has been applied for.

ALLEGAN, MICH.—City has won its sixteen-year fight for a municipal power plant which is to cost $410,000 and will provide 275 jobs for eight months. Opposed by the Consumers Power Company and by agencies to which requests for loans were made, the city last spring appealed to the R.F.C. in vain. Later the P.W.A. returned an adverse decision. Mayor Mosier and counsel took their fight direct to Washington and won over the P.W.A. officials. The government will pay 30 per cent of the cost and the rest is a 4 per cent loan and first mortgages. The Mayor says the project will pay for itself in 30 years and provide an annual profit of $15,000, in all probability.

MEXICO, MO.—Movement started here some time ago for a municipal light and power plant and distribution system has apparently blown up. It had been informally estimated that the plant and some $20,000 improvements to the water works system would cost $450,000.

MICHIGAN — A concerted attack on private utility ownership was made December 2 by representatives of fourteen Michigan communities, including Detroit, in a meeting at Saginaw. The meeting was called to seek an amendment to the new state revenue bond act to permit municipalities to build public utility systems by issuing revenue bonds to repay the cost of construction with P.W.A. funds.

COLUMBUS, MISS. — City has made two proposals to the Mississippi Power Company—that the company give Columbus the same rates that will be in effect in Tupelo under the Tennessee Valley Authority, or that the company sell its distribution system to the city at a price to be arrived at fairly and legally. As an alternative the city has stated that it will construct its own distribution system and purchase power from T.V.A.

WOODWARD, OKLA. — Possibility of securing federal public works funds has brought renewed activity in Woodward on the part of citizens who opposed the sale of that city's municipal electric plant to the Western Light & Power Corporation, which became effective three years ago. It is expected that an application for federal funds will be filed by city officials of Woodward within a few days. Advocates of the project expect to circulate petitions to make a showing as to the number of prospective customers when, and if, a municipal plant is established. The Western Light & Power Corporation after purchasing the Woodward plant three years ago spent $25,000 in repairing it in order to afford proper service. The company pays taxes amounting to nearly $10,000 a year and has given the city rates for street lighting and water pumping which make a substantial saving. Opponents of the new municipal project claim that it could not be financially advantageous.

CULPEPER, VA.—Town officials are planning to issue general obligation bonds immediately for $120,000 with which to build a municipal power plant. In a recent decision in Circuit Court Judge Browning has denied an injunction to James A. Bragg to restrain the town from issuing such bonds, and the federal authorities in Washington have notified the town that the loan, approved some time ago, must be secured by general obligation bonds, and not bonds repayable solely from the revenues of the projected power plant, as last requested by the town. The town will also receive a free grant of $37,500.

Revenue Leaks Checked by New Record System

PERSONNEL must be competent and management alert if public relations are to be at their best and if chances for revenue accounting losses are to be kept to a minimum. But neither of these will suffice in the face of an archaic customer-record system. Delinquency and strained customer credit, common phenomena over the last two or three years, have more than ever necessitated quick, accurate and protective records of customer accounts and locations. Even lacking the present abnormal situation there is the pronounced trend toward dealer co-operation in merchandising that makes immediate credit information something the utility must be prepared to render. And there are always the "bill jumper" and the unbilled active-meter service to worry about.

At Poughkeepsie the Central Hudson Gas & Electric Corporation has had several months' experience with new customer credit history and location files which have demonstrated their capacity to deliver all these benefits and more. This Kardex system of some 25,000 customer cards and 15,000 location cards has replaced a multiplicity of separate collection, credit, deposit and merchandising records. In conjunction with a dictograph installation it has substantially speeded up the handling of service applications. At the same time it has reduced the chance for embarrassing and hazardous errors in decision on deposits or guarantees. Likewise the nomadic customer who hops from one location to another, changing the spelling to another variant of his surname, is very often caught and reminded of the unpaid balance at his last tarrying place. This latter feature is afforded by a phonetic system of filing that gives the ear a new chance to join the eye in effectiveness, already aided as the latter is by a visible type of index.

Experience has shown that these peripatetic patrons often change their first names and are tempted to take liberties with the spelling of their surnames. There are so many ways of spelling many of the common American names because their common origin is several generations remote (to say nothing of the jumbled consonants of some European names) that this becomes a simple way of practicing deceit. In the more densely populated areas this subterfuge is a real hazard to complete collections. In Poughkeepsie this factor was recognized as an important, although not a dominant, factor. However, to derive the benefit of this phonetic filing (which is easily accomplished as an adjunct of the visible records) those surnames which have the same or cognate consonants are all filed together alphebetically by the first name. A number code on the customer card makes it certain that a card is always in its proper place.

The system of the Central Hudson company embraces two Kardex files. One contains the customer data alphabetically Soundexed as above described. The other has the location cards filed by zones, streets and house numbers, showing gas and electric meter installations and removals by number and date along with the rating data and meter location.

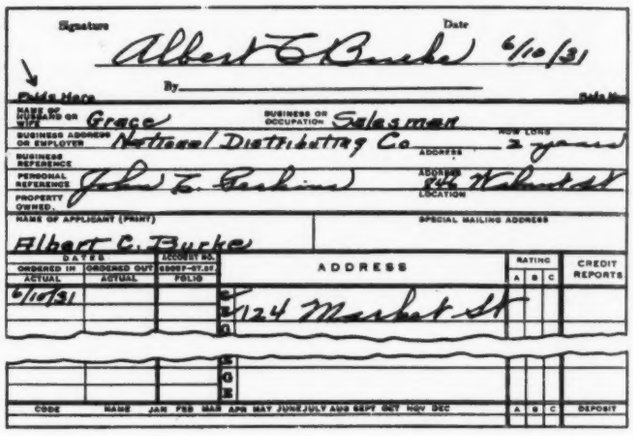


Fig. 1—Customer history concentrated on one card

Card bears full record of guarantees, deposits, unpaid balances, merchandise accounts, etc., at whatever location customer may have had service. Quick picture given on customer's credit standing. Flap (not shown in full) carries customer's signature below standard service-application commitment. Reverse of flap (see Fig. 2) has most of credit record.

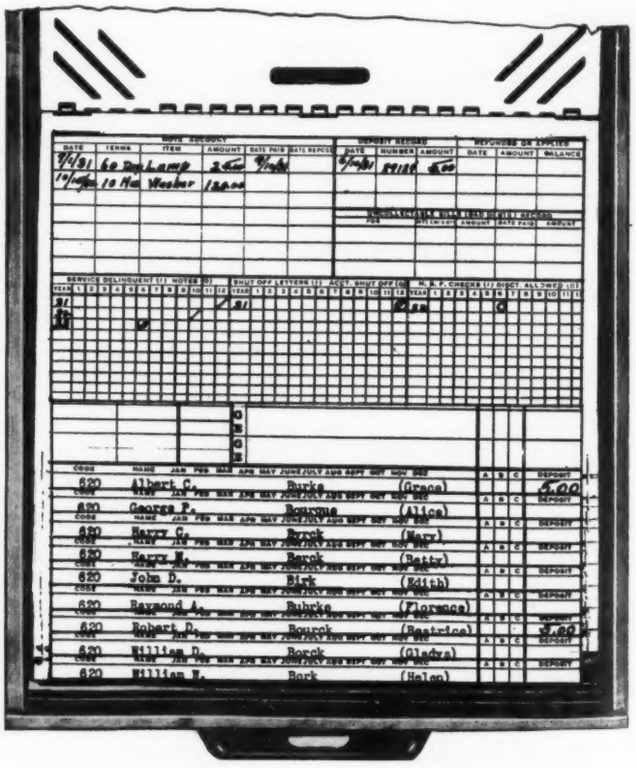

Albert C. Burke (Grace)
George P. Bourque (Alice)
Harry C. Borck (Mary)
Harry H. Borck (Betty)
John D. Birk (Edith)
Raymond A. Burke (Florence)
Robert D. Borck (Electrical)
William D. Borck (Gladys)
William H. Bork (Helen)

Fig. 2—Phonetic file carries full credit record

Record of merchandise sales, deposits, cut-off notices, actual cut-offs for non-payment, n.s.f. checks, discount concessions and charge-offs, all assembled in a single file, make quick handling of all transactions possible.

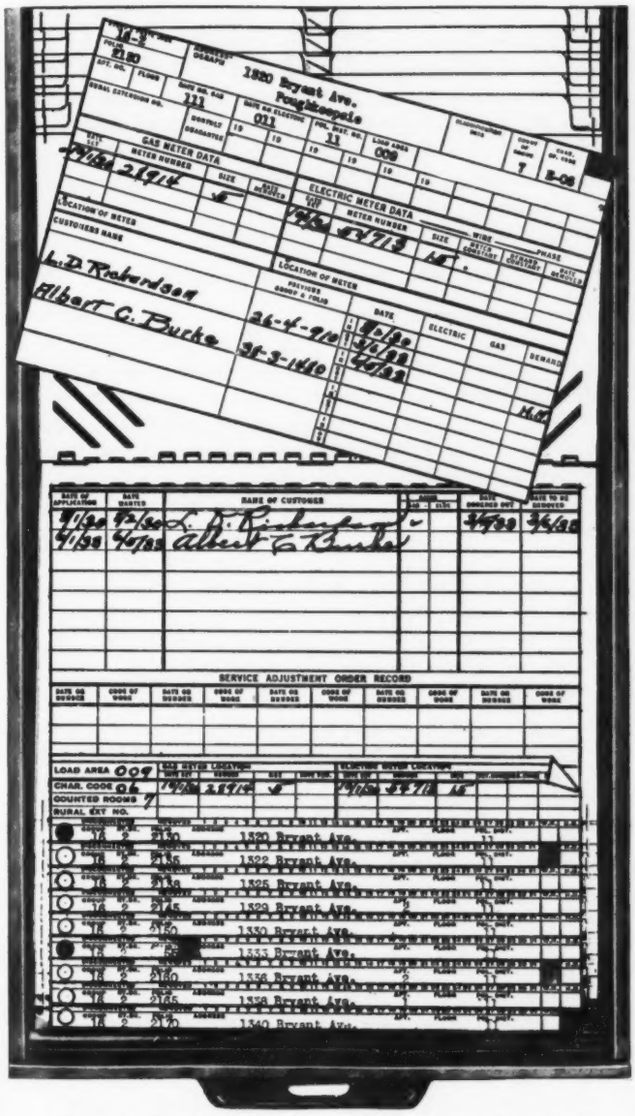


Fig. 3—Service record consists of master card and service order card

Filed by street and house number, the master card remains always in the pocket in the tray. The service order card is filled in as the order is received from the customer and sent into the field to be executed. It has space for eight orders. On completion of the orders it is returned for insertion in the master card. Its reverse side provides for the posting of all changes in the records of orders executed.

To describe the functioning of this system it will be best to begin with the customer file and a new customer applying for service. He signs a buff-colored 4x6 in. (when folded) card which carries the contract form on the rear of the overlapping flap (Fig. 1). The main body of the card gives his wife's name, his business or occupation, employer's name, references, etc. It also carries blanks for inserting the date when meters were ordered in or out at his successive residences. For each location the A, B or C credit rating is indicated and there is also a note made of guarantees and deposits made with cross reference to the deposit number (Fig. 2). The front of the 3x6-in. flap carries a full record of notes on merchandise or service accounts, any refund of deposits or application to bills and a record of past uncollectible accounts. Across the bottom is space for a ten-year record, month by month, of delinquency on bills, notes signed, shut-off letters sent or actual shut-offs for non-payment and n.s.f. checks or unearned discounts. Cards of a different color are used for commercial or power customers.

If this "new" customer has by any chance been a previous customer under a slightly different vocalic spelling of his name the existing card will immediately be found when the credit department is asked to assign a credit rating of A, B or C to this "new" customer. "A" is for those of recognized high credit standing regardless of the amount in dollars involved. After experience, those who are initially assigned "B" rating may be changed to "A" and the deposit returned or to "C" if they habitually lag in payment. Grade "C" is for those who necessitate prompt follow-up and constant collection effort. This collection information is posted daily from the notations placed on stubs or duplicate bills by the office staff and the field men of the collection force.

Quickly establishes appliance credit also

It is evident that so complete a record so conveniently filed in one place can show at a glance whether a contractor-dealer's conditional bill of sale for merchandise is to be accepted for utility financing. As time goes on this record will be increasingly valuable, supplemented, if necessary, by the local credit bureau information in establishing the customer's right to facile acquisition of load-building appliances or better wiring from the local dealers and contractors with which the utility is so closely operating to electrify Poughkeepsie's homes and businesses.

The exposed visible portion of the card as it lies in the filing tray shows only the Soundex code number, the customer's name, his current credit rating and his deposit, if any. The "bad debt" record on the flap incidentally shows the nature of his account, when it may have been charged off the active ledger, the amount and the date when it was finally paid as a prerequisite to rendering new service. With many of the prevailing schemes of filing customer and location records it is quite conceivable that there will be lost accounts, and lost meters too. These would be disclosed by this new composite system and thus recover revenue representing from ½ to 3 per cent of gross in larger metropolitan areas.

The companion file is the "service location" record, which consists of a double card. The master card stays permanently in the file pocket with the zone, route book, street and number, apartment number, floor and governmental district exposed along the visible margin. The folded-back tab at the bottom of this master card also shows the load area, number of active rooms and rural extension number, if any, along with the meter numbers and the dates of their set and removal. The upper part of the master card contains the names of the (eight ultimately) successive occupants of the premises and the dates on which they wanted their meters in or out. The middle portion records the execution of service adjustment orders.

The insert card in the location record is in itself the work order. It carries on its face information repeated from the master card and, in addition, the meter location, the readings of the meters on in and out changes and the folio number for the current occupant. On the back of this insert card is the record of orders executed arranged in the following sequence: Date ordered, date required, description of order, date executed and the dates of execution of other records as this card is routed.

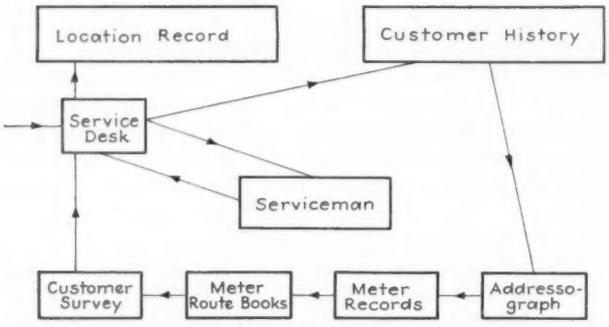


Fig. 4—Poughkeepsie routes its orders this way

The application is sent to the service desk after credit approval has been obtained. It is coded and filed in customer history Kardex and location cards made up. The location card insert (work order) is routed directly to serviceman for execution and returned the next morning to the service desk after completion. The permanent location card and customer history card is then filled in and work order routed to addressograph, meter records, meter route books and customer survey and returned again for permanent fling in the location record pocket.

First it goes to the customer credit history file, then the addressograph, meter records, meter route book and customer survey desk for revision of the files at each point. To whatever extent these separate files can be omitted the combination of the "location record" and the "customer record" afford a complete system which involves a minimum of order writing, transcribing of names and copying of data, all of which take time and multiply chances for error.

Likewise a punched hole in the master location card will indicate at a glance whether the routed card is in the pocket or out on routing for service orders. Tabs can also be used to show the date on which the routed card is due back in the "location" pocket.

As for the location record, it is important that the record show whether the premises are occupied or vacant and whether the meter and service that are there will be adequate for the needs of the new equipment. To ask the prospective customer these questions irks him almost as much as to ask him whether he pays his bills. He expects the company file to have this service information and to find it quickly whether the company has 1,000 customers or 1,000,000. The record in the location file is so clear and intelligible that any one, even a trouble operator at night, can interpret the information and decide what can safely and should at once be done to take care of the emergency call. If authorization for some move is found necessary by telephone, reading the card to the responsible person will be equally intelligible to him.

Many supplementary measures developed for previous systems are readily possible with this visible filing system. Celluloid tabs of two widths and eight colors are slipped over the visible margin of the cards to call attention to ruling credit items. Thus, narrow strips of seven of the colors are used to indicate bad debts in each of the seven years 1927-1933. Wide strips of these same colors are used to indicate cases involved as follows:

Public welfare or child welfare.
Lock-off (placed over the month index).
Active account with bad debt pending.
Credit extension certificate issued.
Special credit approval.
Change of deposit status.

As an indispensable adjunct to these two files there is a dictograph interoffice system which connects with all customer information and application desks, service file, credit desk, billing register, customer file, public contact supervisor desk and district manager office. Any station can call any or all other stations. The handset is replaced at the two service and customer files by a cabinet housing a built-in transmitter and loud speaker. The cabinet can be moved along the files, leaving the clerk's hands free for writing and manipulating the files.

Poughkeepsie official enumerates benefits

During the several months in which this system has been in effect, John J. Gibbons, chief clerk of Central Hudson's Poughkeepsie district, has found the following benefits established:

1. There is a positive contribution to bettered public relations at the very point where irksomeness in the past has often started the customer off with a grouch.
2. Waiting lines of applicants are reduced because time of handling applications is cut by 50 per cent or more.
3. Customer files have been relieved of an immense quantity of paper work in connection with routine collections, meter orders, service equipment orders, appliance sales agreements, credits and allowances. No less than 20,000 filing operations have been eliminated annually.
4. Stationery stocks and printing costs have been cut substantially.
5. Prompt advice can be given to dealers in connection with rush sales of wiring and appliances.
6. Active accounts will receive the consideration they merit; stereotyped and opinionated credit control methods are minimized.
7. Order procedure is simplified and expedited; every department works from the original record; transcription time and error are minimized.
8. Control is facilitated because clerical responsibilities are manifest.
9. Idle meter inventory is reduced because routine control on inactive meters is afforded by the system.
10. Information is more readily available in intelligible form in cases of emergency at irregular hours.
11. The service location record makes for prompt identification of individuals and puts a check on fraudulent applications.
12. There is assurance that collections from incomplete accounts now inactive will more than pay for the cost of setting up the system when these customers begin to come back on the lines.
13. Quicker locating of "final-bill" customers is now possible through business and personal references indicated on the customer record card.
14. Should an inactive customer again apply for service any previous unpaid bill will immediately be identified.
15. Inactive accounts on which there are no bad debts need not be resurrected from the dead file.
16. Payments against bad debt accounts are posted in the same manner as against current active accounts.
17. Inactive deposits can be controlled with greater degree of accuracy than heretofore.
18. Promptness in locking and unlocking meters is facilitated.
19. Meanwhile the saving in time and in costly correction of errors has already fully justified the outlay for the new system.

Grounds Become Ineffective Unless Checked and Maintained

By EDWARD BECK

Lightning Arrester Engineer
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

EXPERIMENTAL grounds which were started in 1926[1] have recently provided the basis for definite conclusions about the permanent effectiveness of grounds as influenced by salt treatment.

Salts applied to the soil, although capable of producing considerable reduction in resistance, will lose their effectiveness with time. This time will vary with the nature of the soil. In compact soil a reasonable degree of effectiveness will persist for perhaps two years. Periodic measurement to determine the need for further salting is advisable.

The salts commonly used appear to be about equally effective. In some localities the use of such salts as were used in these tests may be undesirable because of their possible effect on deep-rooting vegetation. For such cases a chemical fertilizer such as ammonium sulphate has been considered and used in some cases, it is believed. We have no test data on this, but there is no apparent reason why it should not be effective in reducing resistance.

No corrosion appeared on the three types of electrodes tested, either in unsalted or salted soil. Further observations along this line are contemplated for the future.

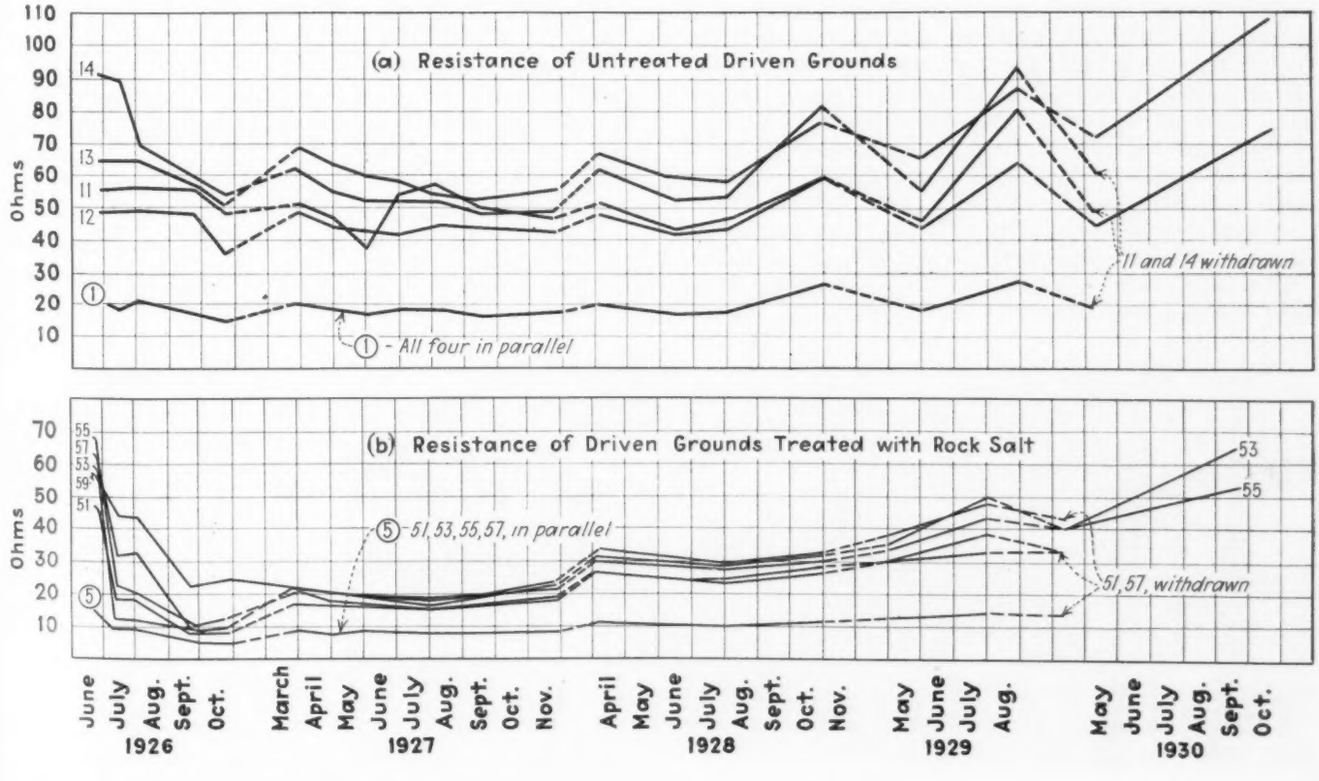
The use of multiple unsalted grounds is probably less troublesome than salting, if space is available and a satisfactory resistance can be reached, because they will require little attention after the work of installation has been done.

Some data on the behavior of grounds when subjected to impulse voltages have already been published.[3,4] It seems that driven grounds which are relatively high when measured by low-voltage methods will show a considerably lower impedance when measured with high applied impulse voltages, whereas grounds which measure low by the usual methods show little change in same impedance to heavy surges. Although high grounds come down in impedance when high voltage is applied, they are still not good protective grounds, because high voltage must be applied to them to reduce the resistance. It is therefore concluded that the measured resistance is a fair indication of the effectiveness of a driven ground as a protective measure.

When low resistance cannot be reached economically by driven grounds special measures must be employed, such as have been discussed in the literature. From the

Salt disappears in about five years

(a) Electrodes driven in untreated and relatively poor grounding soil gave these variations in resistance over a period of five years. Obviously, 1930 was an unusually dry year, the lack of moisture being apparent in the sharp increase of resistance.
(b) The electrodes were salted in, reducing and helping maintain uniformity of resistance. A gradual increase of the resistances from year to year is apparent, as the salt is carried away by rains and thaws, the latter being probably the more potent. In 1930, about five years after the salt had been applied, the effect of the salting had practically disappeared.



standpoint of lightning protection it is advisable to eliminate ground resistance effects by shunting arresters around the equipment, with a common ground or interconnected grounds for both.

During these tests the behavior of several different groups of electrodes was observed, as previously discussed.[1] The behavior of the resistance of only the two groups shown in the figure is discussed here, since the other salted grounds were similar as indicated in group 5.

This behavior of salted grounds indicates the need for periodic measurement of ground resistance. In the accompanying illustration (b) seems to be typical of grounds in salted compact solid such as that common in the Pittsburgh district. However, in some soils the salt effect may disappear more quickly. For instance, Towne shows tests on electrodes in salted gravelly soil (Fig. 12 or reference No. 2), in which the resistance has increased appreciably in a few months.

In the spring of 1930 samples of the three types of electrodes used—plain iron pipe, galvanized iron pipe and copper coated rods—were withdrawn from each group for examination. There was no corrosion evident on any of them. On the other hand, rods have been seen which were badly corroded in a short time. This is thought to be caused by particularly acid soil such as might exist around coal mines or where the soil about the electrodes is treated with discarded battery acid. This latter practice, although productive of low resistance, is not to be recommended from the standpoint of corrosion. Corrosion is also more likely to occur if the grounds carry current, which is usually not the case with arrester grounds. In these tests the salts used did not corrode any of the electrodes examined during the period for which they were in the soil.

Short Bibliography on Grounding

[1]Beck, "Tests of Arrester Grounds," ELECTRICAL WORLD, March 3, 1928, page 443, and Appended Bibliography.

[2]Towne, "Lightning Arrester Grounds," *G. E. Review*, April, 1932, page 215.

[3]Towne, "Impulse Characteristics of Driven Grounds," *G. E. Review*, November, 1928.

[4]Beck, "Progress in Lightning Protection," *Railway Signaling*, April, 1929, page 145.

[5]Morgan and Taylor, "The Resistance of Earth Electrodes." *Journal of the I. E. E.* (British) June, 1933, page 515.

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Tests Usefulness of Storm Guys

By L. H. HARDIN

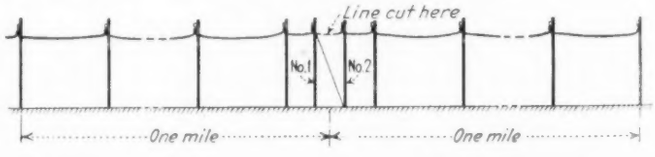
Engineer Georgia Public Service Commission

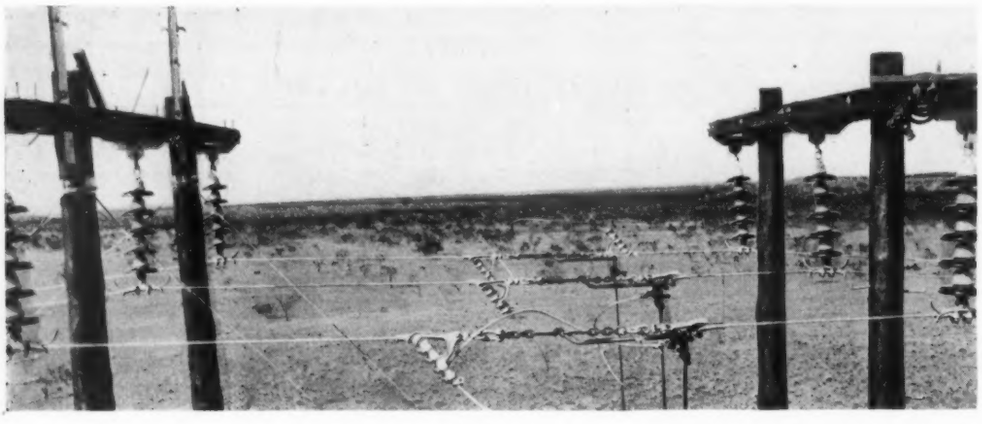
GUYING of cross-country construction is usually a mixture of adherence to precedent, based on arbitrarily assumed conditions, and of the best attempt possible to predict weather conditions that may prevail in the territory involved. These assumptions, particularly where wooden poles and arms are used, are further complicated by the uncertain strength and character of run-of-the-woods timber and its frequent refusal to perform in consistent fashion, particularly when subjected to bending stresses. Such circumstances frequently impel the designer to a degree of overconservatism which has a very important bearing on costs.

A public utility operating in Texas, faced with the necessity of constructing several hundred miles of 60-kv. "H"-frame line in territory well exposed to wind, developed a lively curiosity as to whether the design criteria for guying were not overconservative; whether, under extreme conditions of loading as to ice and wind and with the severance of one or all conductors, complete wreckage of great lengths of line might really occur.

Accordingly, experiments designed to reproduce artificially the loading corresponding to ½ in. of ice and a 60-mile wind were carried out on a section of line under construction with interesting results as to its behavior as set forth in detail below.

The construction consisted of two 50-ft. poles in "H"-frame assembly with single 6-in. x 6-in. x 20-ft. creosoted pine crossarms and five-unit suspension insulators. The normal spans were 550 ft. long and stringing tension was 4,500 lb. for the No. 4/0 A.C.S.R. conductor.

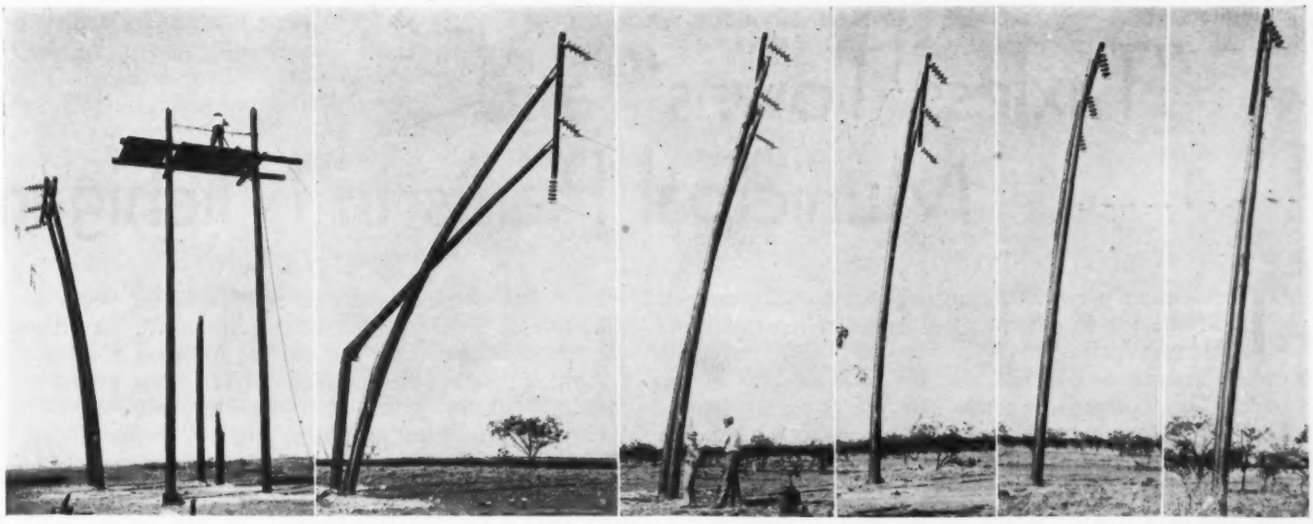




Line was cut in the middle

In the center span of a 2-mile straight, flat stretch of No. 4/0 A.C.S.R., 550-ft. span, H-frame line were erected two test frames. The only guy in the 2-mile length was that on test frame No. 1. To simulate the vertical loading component of ½ in. of ice on the conductors in a 60-mile wind sandbags were hung on the wires for a mile on each side of the span to be cut.

To part all three conductors simultaneously



What happened when line was cut

At the extreme left is the guyed test frame, No. 1, which did not fail. Below the observation platform are seen the stubs of unguyed test frame No. 2, one pole of which snapped off immediately, the other breaking more slowly. Next are the first five frames adjacent to test frame No. 2. The first of these five failed slowly, twelve hours to break. The inclinations of the other four frames show how the strain in the line distributed itself after the failures of the test frame and the frame immediately next to it.

A section of line 2 miles long with absolutely flat profile was selected for the experiment and the combined load of wind and ice applied as a vertical load in the form of sandbags tied to the conductors so as to achieve the calculated load per foot of conductor. The elongation of the conductors under the extreme loading is readily observed in the pictures. In the center span of the 2-mile section two standard "H"-frames were erected, with provisions for parting simultaneously all three conductors between the frames by an improvised tripping device. One of these "H"-frames was guyed in the regulation manner, the other was not guyed, nor were intermediate guys installed in the adjacent 1-mile sections of line. No special material was used in the construction of these test sections so that they might remain a normal section of line.

With the set-up as detailed in the foregoing, all three conductors were simultaneously parted with results as set forth below:

1. In the mile section terminating in the unguyed "H"-frame this first frame broke, one pole snapping immediately, indicating dead timber, the second failing slowly.

2. The next adjacent frame, 550 ft. away, bent severely, but did not fail for twelve hours, the final failure being chargeable to defective timber.

3. The next four adjacent frames, called upon to assume the unbalanced load, bent in varying degree, none dangerously, until the entire unbalanced stress had been absorbed.

4. Of the mile section terminating in the guyed frame no failure occurred, but the frame pulled over about 15 deg., the anchor slug was pulled half out of the earth and the guy stressed apparently near the point of failure, as its reduced diameter indicated.

It seems reasonable to conclude that in a line of average span length and sag, even under the extreme shock incident to parting three conductors under maximum load, the failure of not more than two frames (and probably not more than one) might be expected and the elasticity of the remaining unguyed wood structures is a more desirable means of absorbing the unbalanced stress than attempts at relatively widely spaced rigid head guying, particularly since such guys could offer no useful aid unless the failure occurred in a span adjacent to them.

▼

Finds Under-Water Welding Possible

Although it has long been known that the electric arc will continue to function when immersed in water, it is only a recent discovery, according to N. S. Hibshman* and C. D. Jensen, Lehigh University, that the arc may be so directed and manipulated as to produce welds of high quality between totally immersed pieces of metal. Some form of arc shielding is necessary to control and direct the arc and limit its exposure to the agitated water. Three commercial types of covered electrodes, not named by the authors, have been found fairly suitable, each having certain advantages and counter-balancing disadvantages, such as clouding the water or leaving a heavy coating of slag on the weld. One is oxide-coated, another covered with organic material and a third with a thin coat of heat-resisting waterproof enamel.

If it is intended to lay only a bead upon a flat plate the rim of the arc-protecting cone or electrode shield may be rested on the work. When making a weld between plates, however, this is not possible, and considerable practice is required to control the arc. When the arc is working properly it produces a steady low-pitched rumble, but when it is too long there is an irregular train of sharp, explosive sounds.

Many tests of under-water welds both in tension and with free-bend specimens indicate that good quality welds can be made on low-carbon steel. Messrs. Hibshman and Jensen say that under-water welding may be desirable when it is desired to limit the heat penetration from the weld or avoid distortion of the parent metal.

**Speaking before American Welding Society.*

"Taxless Towns" and Municipal Plants in Michigan

TAX rates per $1,000 assessment for 1932 averaged $14.81 for 46 incorporated towns having municipal electric plants, $14.17 for 420 with privately owned service and $14.24 for the total of 466 in the state. This is the reply made in a recent survey by the Utilities Information Bureau of Michigan to "taxless town" propaganda. Fifty-eight Michigan incorporated towns had what might be considered notably low local tax rates in 1932—$7 or under in the case of towns below 5,000 population, $12 or under in the case of towns above 5,000 population. Fifty of these towns receive electric service from privately owned utilities; eight have municipal electric plants. In all cases where towns achieved low tax rates they sharply curtailed expenditures, reduced governmental service, or drew upon surplus funds laid by in more prosperous times. Some employed all these methods. There was no sudden, magical, continuing bountifulness out of municipal electric plant operation.

Only one of the 46 municipal plant towns had a local tax rate which was not matched or outmatched in lowness by one or more non-municipal ownership towns in the same population class. This town was Sturgis, which, through a combination of drastic economies and favoring circumstances, was able to reduce its 1932 rate to $1.10 per $1,000. The few towns which were able to lower their tax rates through contributions from municipal plants were outnumbered by former municipal ownership towns which in 1932 had much lower tax rates than when they were carrying tax burdens imposed by unprofitable and now discarded municipal business ventures.

State tax commission records used

The 466 incorporated towns considered in the survey —all those with electric service—included 326 villages and 140 cities. Their local tax rates were computed from the 1932 tax records of the Michigan State Tax Commission. The rates thus computed were checked against tax information supplied by city and village treasurers and against local tax bills of electric utilities operating in the state.

Thirty of the 46 Michigan incorporated towns operating municipal electric plants in 1932 were below 5,000 population. In the same population class were 364 towns receiving electric service from private utilities. The 30 towns with municipal plants had an average local tax rate in 1932 of $16.14. The 364 towns served by privately owned utilities had an average local tax rate of $14.07.

Eight Michigan "taxless towns"

Heading this class of below 5,000 population were eight so-called "taxless towns," Applegate, Cass City, Clinton, Gagetown, Luther, Pewamo, Saranac and Ubly. These "taxless" towns, all villages, were able to get along without levying village taxes in 1932 because they had curtailed village governmental expenditures to such an extent that surpluses accumulated in better years were able to tide them over. All but Clinton are served with electric light and power by private utilities. Clinton has a municipal steam-electric plant. While these towns were "taxless" to the extent that they levied no taxes for village governmental purposes, property owners living in them were called upon to pay local township taxes, school taxes, county taxes, state taxes and other taxes at the rate per $1,000 valuation shown in an accompanying table.

President George W. West of Cass City declared in the spring of 1932 that the village owed its excellent financial condition to the fact that it had freed itself from its unprofitable, money-losing municipal electric plant. "The village electric plant was eating us up," he said. "When the chance came in 1924 to get electric power from a system we grabbed it. The beginning of our financial recovery dates from that time."

Village Clerk Moses P. Freeman of Gagetown also ascribes that village's 1932 "taxless" condition to its financial recovery after getting rid of its municipal electric plant. "Our tax rate, which had been up to $20 per $1,000, dropped as soon as we got rid of our generating plant in 1923," he said. "On March 2, 1932, we had $1,715 surplus in the bank in addition to a $3,000 sinking fund, so we decided to levy no village tax for the fiscal year. Gagetown still owes $3,000 bonded indebtedness piled up by the municipal plant. This is payable at the rate of $500 a year."

The case of Clinton

The case of Clinton is of particular interest in view of repeated claims that "profits" from the municipal steam-electric plant paid the expenses of running the village in 1931 and 1932, thus making it "taxless."

The annual village financial reports for 1928, 1929, 1930, 1931 and 1932, published in the local newspaper, show that the village operated during the two "taxless years" not on "profits" from the municipal plant but on surplus funds accumulated in immediately preceding "fat" years mainly through excess tax levies.

During the fiscal years 1928, 1929 and 1930 the village treasury had receipts of $58,910, including $40,960 from tax levies, $4,444 from miscellaneous sources, $7,957 from the street funds and $5,550 transferred from the electric light fund. Clinton's normal running expenses at that time were between $9,000 and $11,000 a year. Consequently the tax moneys and other receipts were far more than Clinton needed for operating during these three years, even after it had paid Chicago street paving bonds of $4,052 and contributed $6,800 of village money toward the payment of municipal waterworks bonds, supposed to be self-liquidating.

Thus Clinton came to the beginning of a new fiscal year on March 1, 1931, with balances in the general and contingent funds totaling $24,894.95. This, with estimated 1931 receipts from fines, hall rent, fees, outside

contributions to the street fund and other sources added, was several times the normal yearly operating expenses of the village—and citizens generally were demanding tax relief. Hence, the decision of the Council to levy no village tax in 1931.

Why the report was given out that the village was made "taxless" because of "profits" from the municipal plant is not evident.

Plant has deficit in 1932

Clinton did not call upon the municipal plant for help in 1932, which was fortunate, for the plant was not able to make ends meet. It had an operating loss of $1,170, according to the financial report, and this in spite of sharp curtailments of expenditures and without charging depreciation and other proper costs. It ended the year with a balance on March 1, 1933, of $3,961.63, as compared to balances of $5,132.05 on March 1, 1932; of $6,223.15 on March 1, 1931, and of $9,723.47 on March 1, 1930.

The financial reports for the past five years, which include the biggest business years ever enjoyed by the plant, show that the Clinton electric light fund made in that period only three transfers of money to tax-supported village funds. These were as follows: $550 in 1928 to the general fund, $5,000 in 1930 to the sinking fund, $1,500 on February 8, 1932, to the street paving fund; total, $7,050.

Rates of former municipal plant towns

Included in the population class below 5,000 are a number of towns that formerly had municipal electric plants. Some of these had much lower local tax rates in 1932 than they had ten years previously when still in the electric light and power business. An accompanying table shows the village or city tax rate paid in 1922 and the rate paid in 1932:

Population 5,001 to 10,000—Eight towns of the 32 in the 5,001 to 10,000 population class have municipal electric plants. Sturgis, with a city tax rate of $1.10 per $1,000, led all towns in the state in low local tax rates in 1932. Sturgis has a municipal hydro-electric plant and purchases part of its power supply from private sources. Sturgis was able to reduce its tax rate to this record figure by cutting city expenses to the bone and by taking advantage of favorable hydro-electric operating conditions.

The Council slashed the city budget 20 per cent from that of 1931, lowering it to $31,508. The municipal plant was put on a rigid economy basis and had a good water power year. The result was that it cut $19,220 from operating costs. This saving made it possible for the municipal plant revenues to carry the bulk of the city's curtailed governmental expenses. How the eight municipal plant towns in the 5,001 to 10,000 population class ranked with the 24 towns served by private utilities is shown by Table III.

Hastings, which is served by a private utility system, was in second place. It achieved a low rate of $7.67 by wise city management. Coldwater's low rate of $9.70 was gained largely though sharp economies and the fact that during better years the city had cleared away its bonded indebtedness. The municipal electric plant's contribution to the city was in the form of free street lighting and free electricity for city buildings. Negaunee, which has a municipal distribution system, met a desperate city financial situation by slashing 43 per cent from its 1931 budget, thus getting down to a rate of $10.42 in 1932. The municipal distribution system does not appear to have contributed to the tax reduction. Marshall, it may be noted, actually increased its local tax rate in 1932, being an exception to the rule. The rate in 1931 was $12.45. Three dollars of the increase went to interest and sinking fund.

Table I—Actual 1932 Tax Rates of "Taxless Towns" in Michigan in Population Class Below 5,000

Town		State Tax	County Tax	School and Mill Tax	Misc. Taxes	Gen. Township, Road Repair, Etc.	Total Tax Rate
Applegate	P	$4.25	$10.04	$10.64	$2.57	$4.30	$31.79
Cass City	P	3.92	5.61	13.23	1.12	1.97	25.85
Clinton	M	3.38	3.71	8.78	0.15	2.00	18.02
Gagetown	P	3.85	5.49	4.68	4.35	2.27	20.82
Luther	P	2.35	17.90	14.56	0.13	2.99	37.93
		2.36	14.00	15.00	.....	6.00	37.36
Pewamo	P	3.92	6.99	4.53	2.56	2.93	20.93
Saranac	P	3.65	6.74	10.69	5.73	2.83	29.66
Ubly	P	3.98	3.12	7.49	1.39	3.09	19.07

P — Served from privately owned electric utility.
M — Served from municipally owned electric utility.

Table II—Tax Rates in 1922 and 1932 in Towns Below 5,000 Population that Formerly Had Municipal Plants

Town	1922 Municipal	1932 Private	Town	1922 Municipal	1932 Private
Applegate	$25.00	No levy	Ithaca	13.75	10.00
Ashley	15.00	$10.00	Litchfield	10.00	5.00
Cass City	21.06	No levy	Marlette	17.50	10.00
Chesaning	17.00	9.00	Merrill	20.00	11.07
Clayton	10.00	6.00	Onsted	14.00	4.00
Constantine	10.00	6.00	Ontonagon	19.00	15.04
Dimondale	15.30	5.38	St. Ignace	22.10	14.13
Empire	20.00	15.00	Shepherd	29.90	10.00
Evart	17.50	10.00	Ubly	19.52	No levy
Gagetown	20.00	No levy	Whitehall	19.50	10.00

Table III—Tax Rates of Municipal Plant Towns

Town	Power	Rank	Local Tax Rate
Sturgis	Hydro	1st	$1.10
Coldwater	Steam	3rd	9.70
Negaunee	Purchased	4th	10.42
Hillsdale	Steam	5th	10.60
Petoskey	Hydro and purchased	23rd	15.49
Grand Haven	Oil and steam	24th	15.60
Gladstone	Purchased	25th	15.62
Marshall	Hydro, oil and purchased	26th	16.50

Population 10,001 to 25,000—Monroe, which is served with light and power by a privately owned electric utility, led towns in the 10,001 to 25,000 population class with a 1932 local tax rate of $6.85. Niles, which has a municipal hydro-electric plant and buys part of its supply from a utility system, had a local tax rate of $6.96. In 1931 Monroe had a local tax rate of $11.81 and Niles a rate of $13.25. The Niles municipal electric plant claimed a profit of $51,539 for the fiscal year ended March 31, 1933. It furnished street lighting without direct cost and transferred to the city $69,000 for relief aid. The municipal plant serves only domestic, commercial and small power users. The Niles situation raises two pertinent questions:

First—Is a community justified in taxing electric customers higher rates in order to secure lower tax rates for property owners?

Second—Should electric service and tax service be made to bear each other's burdens and responsibilities?

Niles, while a leader in low tax rates in 1932, was at

the other end of the line in electric rates. Eighteen of the 23 towns paid less for electricity, three Upper Peninsula towns—including Escanaba, which has a municipal plant—paid about the same, and one isolated town had higher electric rates.

Tax bills or electric bills?

Had Monroe domestic, commercial and small power customers paid for the 6,965,685 kw.-hr. of electric energy they used in 1932 at the average rates paid for these three classes of service in Niles, their aggregate bills of $293,199.25 would have been increased to $375,900. Had Monroe electricity users applied the difference of $92,700.75 to city tax reduction they could have cut Monroe's rate $3.02 per $1,000 on an assessed valuation of $30,657,293. This would have brought the city tax rate to $3.83 instead of $6.85. Monroe formerly had a municipal plant.

Above 25,000 population—Michigan has seventeen towns above 25,000 in population and three of these have municipal electric plants giving so-called commercial or general service. Fourteen towns in this class served by privately owned utilities had an average local tax rate in 1932 of $14.08. The three cities with municipal plants, Wyandotte, Lansing and Bay City, had an average local tax rate in 1932 of $14.17. The seventeen towns ranked as follows: Jackson, $9.92; Muskegon, $11.39; Kalamazoo, $11.40; Ann Arbor, $11.60; Battle Creek, $12; Dearborn, $12.07; Wyandotte,* $12.50; Highland Park, $12.60; Port Huron, $12.78; Lansing,* $13; Flint, $15.20; Grand Rapids, $15.28; Pontiac, $16.58; Bay City,* $17; Saginaw, $17.55; Hamtramck, $18.50; Detroit, $20.24.

Municipal plants that gave help

Fourteen—and possibly one or two more—of the 46 municipal plants in the state made contributions of one sort or another in 1932 to their town governments. The Blissfield, Clinton, Coldwater, Eaton Rapids, Niles and Sturgis plants furnished free street lighting. The Grand Haven, Gladstone, Holland, Marquette and South Haven plants paid local taxes. The Bellaire, Bellevue, Blissfield, Grand Haven, Gladstone, Holland, Niles, Sturgis and Wyandotte plants provided special revenues of a tax-reducing nature.

Whether the contributions of the fourteen plants constituted adequate recompense or repayment to their respective towns for public funds, public efforts and public sacrifices invested in them in the course of years, or, in some cases, for higher electric charges than necessary in the past or present, or, in most cases, for lost taxes through a long period, remains a large and pertinent question. This question could only be answered by a careful audit of each plant covering a considerable part of its existence.

**Municipal plants.*

▼ ▼ ▼

Loading Newer Transformers Saves Large Core Loss

By H. E. TURNER
American Gas & Electric Company

In system operation appreciable savings may be effected by taking advantage of the low constant losses and reliability of modern power transformers.

Load conditions, particularly those of today, make it possible in many cases where more than one large bank is installed at a station to keep one bank out of service over considerable periods, or at least to take a bank out of service during light-load periods. Worthwhile economies can be made by taking out the old banks and keeping the newer banks in service. Many new units have been purchased and held as spares for existing banks. In this case a definite saving can be made by putting the new spares in operation and keeping the older replaced units out of service as the spares. Small power banks are replaced from time to time with larger banks and the smaller banks are moved to other locations. In this case considerable saving in losses can be made by selecting from the stock of transformers those which are the newest.

The accompanying tabulation shows several concrete examples of what the difference in losses is for large transformers of different ages at several large substations on one system. The principal difference is in the iron losses; load losses show smaller differences.

It may be observed that the newest transformers in each substation totaling 127,500 kva. have a total no-load loss of only 261 kw., whereas the older transformers, totaling 111,000 kva., have a total no-load loss of 586 kw., or 125 per cent more, despite the fact they have 13 per cent less capacity. Looked at another way, the older transformers require about 2,850,000 kw.-hr. more per year just to supply core losses than the newer ones. In operating these substations, substation C requires the operation of two banks. On the basis of operating the two newest banks of substation C and only the newer bank at each of the other substations about 3,880,000 kw.-hr. less would be required yearly for core losses than if all banks were energized continuously, or about 1,600,000 kw.-hr. less yearly than if the load were carried only on the older banks. In general, differences in core losses of the order shown here may be expected to exist between old and new transformers of ages comparable with those given.

It is particularly interesting that at the substations with banks of unequal size the newer and larger bank can, because of the large reduction in no-load losses, carry not only the full load capacity of the smaller bank but also any load down to zero more economically than the smaller bank, except in the one case. Even in this case, taking into consideration the copper losses, the smaller bank has no advantage except below 2,000 kva.

Substation	Capacity of Transformer Bank, Kva.	Core Loss of Bank, Kw.	Full-Load Copper Loss, Kw.	Year of Manufacture
A	1-30,000	136	180	1923
	1-45,000	76	245	1930
B	1- 6,000	43	47	1922
	1-22,500	47	151	1930
C	1-30,000	147	176	1915
	1-30,000	143	171	1917
	1-30,000	62	146	1928
D	1-15,000	117	92	1924
	1-30,000	76	164	1927

Selector Sorts Commercial from Operating Communications

By ALVA M. BURNETT

Designer Communication Department,
Southern California Edison Company, Los Angeles

PRIVATELY owned telephone lines of the communication network serving the Southern California Edison Company, Ltd., are called upon to furnish a number of widely different services such as load dispatching, commercial department contacts between the main office and outlying districts, contacts between suboffices and district offices, etc. There are some fifty magneto telephone or toll lines serving as contact between the central load dispatcher, the main offices and the outlying districts. For convenience, these lines are terminated in a communication center where they are connected to three separate telephone switchboards, a dispatcher's board, a toll board for making connections to the main offices and other lines and a wire chief's board.

A large majority of these lines are of the "party line" type, having a number of stations on the same line, where the desired party is called by a code ring consisting of a combination of long and short rings. Under the old method of operation, if a magneto station desired to call another magneto station on the same line or any one of the several boards, the code ring was received on both the dispatcher's board and the toll board, thus necessitating a constant vigil on the part of the operators in order that they might be able to determine when they were being called, which, from an operating standpoint, was very unsatisfactory.

In order to overcome this objectionable feature a piece of equipment has been developed by this company which makes it possible for a magneto station to select the board desired, by a special code ring consisting of an initial long ring which will always be of greater duration than the ordinary long ring, so that if a magneto station is calling another magneto station the code ring will not operate the a.c. selector and no audible signal will be heard by the operator on any of the boards connected to the selective ringing device.

Selector rings only station desired

If a magneto station desires to call either the dispatcher's board or the toll board the initial long ring will be of sufficient length to start the operation of the selective ringing circuit and successive short rings will select other boards as desired, bringing in the line lamp on only the particular board called. This device is known as an "a.c. selector," it being actuated by the $16\frac{2}{3}$-cycle alternating current of the usual telephone magneto generator and is capable of selecting and making connections to from one to 25 switchboards or other

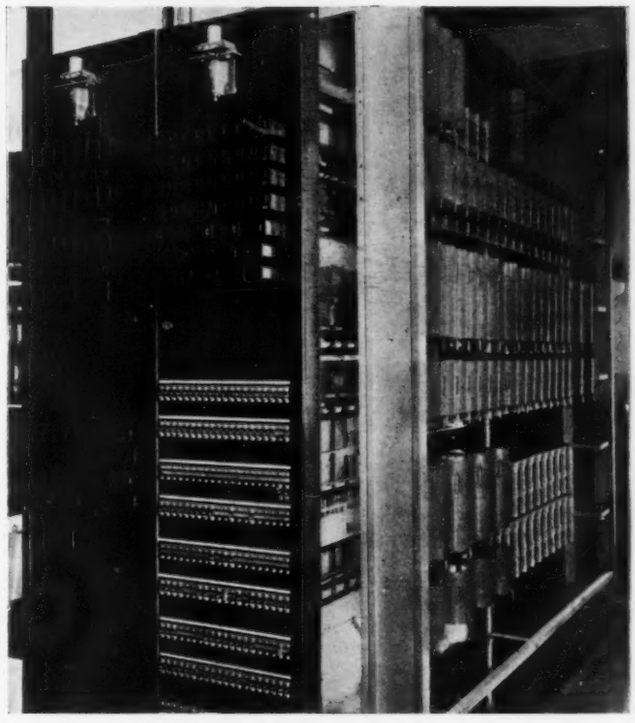


Fig. 1—Relays and fuses mounted on separate panel

Line relays on upper part of panel at left and individual fuses on lower part of right panel.

toll lines. The result is that so far as the dispatchers and toll operators are concerned the lines do not appear as party lines, their lamps lighting only when they are wanted and remaining permanently lighted until they are answered.

In the a.c. selector circuit as used by the Southern California Edison Company, Ltd., at its communication center each party line is terminated on the three boards in the usual manner, only the line lamp and the night alarm signal being controlled by the selector; however, if desired, the selector may be adapted so as to make line connections from toll line to toll line, toll line to switchboard, etc.

These a.c. selectors have been in constant use for 26 months, giving entirely reliable service. Since the initial adjustments were made, at the time they were put in service, they have given absolutely no trouble, either mechanically or electrically. The reduction of confusion on the dispatcher's and toll boards has been very satisfying. There has been a decided decrease in the time necessary to complete a call, thereby affecting an economic saving through the reduction of operators necessary to handle the traffic. With the a.c. selector system it is not necessary to change or add any equipment on

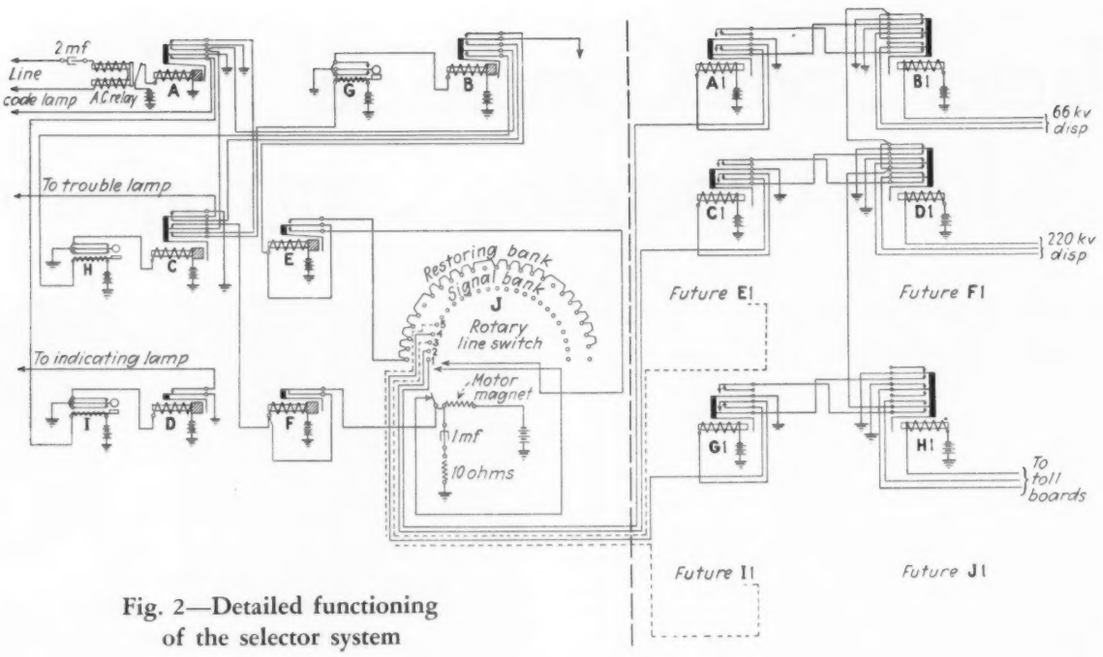


Fig. 2—Detailed functioning of the selector system

Before going into the operation of the circuit, let us assume that the initial long ring should cover a period of time greater than 3½ seconds and the short rings approximately one second each; that relays *G* and *B* have been adjusted for 3½ seconds operation; that relay *H* (which will be kept in motion during the short rings) and relay *C* have been adjusted to four seconds operation; that relay *I* (which will also be kept in motion during the short rings) and relay *D* have been adjusted for twelve seconds operation.

When the initial long ring of "3½ seconds plus" duration is impressed upon the line the alternating-current relay pulls up, taking the ground off relay *A*, allowing it to release, taking the ground off the upper make contact, that goes through the lower break contact on relay *C* to relay *G*, allowing it to release and start vibrating. When relay *A* released it placed a ground on its upper break contact, that goes to the middle make contact on relay *C* and to the lower break contact on relay *B;* at the same time it placed a ground on its lower break contact that goes to relay *I* and the "code" lamp.

The "code" lamp remains burning and relay *I* remains energized for the duration of the ring.

When relay *I* pulled up it energized relay *D*, which pulls up, bringing in the "indicating" lamp on the dispatcher's board, which remains burning during the balance of the operation, due to relays *I* and *D* being timed for twelve seconds operation. Relays *G* and *B*, being timed for 3½ seconds operation, relay *G* vibrates for that period of time and then comes to rest, taking the ground off relay *B*, allowing it to release. Relay *B*, being a slow-to-release relay, has been held up by the pulses of ground, sent from relay *G* while vibrating. When relay *B* released it took the ground off the upper make contact that goes to relay *E*, allowing *E* to release, opening the ground circuit through its make contacts and taking the ground off the restoring bank of the rotary line switch.

At the time relay *B* released it placed a ground on its upper break contact, which goes through the upper break contact on relay *C*, bringing in the "trouble" lamp on the wire chief's board, at the same time closing the circuit from ground at relay *A* through the lower break contact on relay *B* to relay *H*, pulling it up. This, in turn, pulls up relay *C*, transferring the "trouble" lamp circuit through its upper set of contacts from relay *B* to relay *C*, at the same time opening the circuit from relay *A* through its lower break contact to relay *G*, so that during the balance of the operation relays *B*, *G*, and *E* remain normal.

At the end of the 3½ seconds interval, when relay *G* stopped vibrating, relays *B* and *E* released and *H* and *C* pulled up, a ground is sent from the upper break contact on relay *A* through the middle make contact on relay *C* to relay *F*, thence through the break contact on relay *F* to the motor magnet on the rotary line switch, stepping it around to the first contact before relay *F* (which is a slow-to-pull relay) has had time to operate and open the circuit to the motor magnet. At the end of the initial long ring relay *A* pulls up, relay *F* releases and relays *H* and *I* start vibrating for four and twelve seconds, respectively, holding up relays *C* and *D*.

Before four seconds have elapsed, the time to which relays *H* and *C* have been adjusted, the first short ring should start. The short ring of one second will operate the alternating-current relay and release relay *A* as before (relays *G*, *B* and *E* being in a normal position), placing a ground on the lower break contact of relay *A*, again lighting the "code" lamp and pulling up relay *I*, which is still vibrating and holding up relay *D*, thus keeping the "indicating" lamp on the dispatcher's board burning; when relay *A* released it placed a ground on its upper break contact that goes through the lower break contact on relay *B* to relay *H*, which is also still vibrating and holding up relay *C*, thus keeping the "trouble" lamp on the wire chief's board burning. At the same time a ground was placed on the upper break contact of relay *A* that goes through the middle make contact on relay *C* to relay *F*, and thence through the break contact on relay *F* to the motor magnet on the line switch, stepping it around to the second contact before relay *F* has had time to operate and open the circuit to the motor magnet.

Assuming a code signal of one initial long and one short having been completed, relay *A* pulls up and relay *H* vibrates for four seconds, at the end of which time relay *C* releases, opening the circuit to and extinguishing the "trouble" lamp, closing the circuit from ground on the upper make contact of relay *A* through its lower break contact to relay *G*, pulling it up, which in turn pulls up relay *B*. When relay *B* pulled up it put a ground on its upper make contact that goes to relay *E*, which being a slow-to-pull relay allows the ground to pass through its break contacts, thence through the signal bank of the rotary line switch to relay C^1 on the associated relay group, pulling it up before relay *E* has had time to operate.

When *E* operates it transfers the ground from the signal bank of the line switch to the restoring bank of the same, through the restoring wiper to the motor magnet, causing the line switch to rotate to a neutral position, or one that has no ground on the restoring bank contact. Relay C^1 locks up from ground on the upper break contact of relay D^1 that goes through the lower make contact on C^1, thence through the coil to battery. When relay C^1 locked up it placed a ground on its upper make contact, which goes through the lower break contact on relay D^1 bringing in the line lamp, which continues to remain burning.

When the operator answers the call a ground is placed on the sleeve wire, which energizes and pulls up relay D^1, opening the lamp circuit through its lower break contact and extinguishing the line lamp, at the same time opening the circuit from ground through its upper break contact to

relay C^1, allowing C^1 to release. When relay D^1 pulled up it also placed a ground on the busy lamp common which brings in the busy lamp on the boards over which the one called has right of way. Relay I vibrates for twelve seconds after the completion of the last ring, holding up relay D, at the end of which time relay D releases, opening the circuit to and extinguishing the "indicating" lamp. The a.c. selector circuit then is again in a normal position.

Fig. 3—Slow-acting and pendulum relays distinguish the signals

A is a slow-to-release relay which controls the operation of the circuit through make-and-break contacts (see Figs. 2 and 3).

B is a slow-to-release relay which closes the circuit to relay H and the "trouble" lamp and opens the circuit to relay E and the restoring bank of the rotary line switch.

C is a slow-to-release relay which transfers the ground that operates the "trouble" lamp on the wire chief's board, from relay B to relay C, opens the circuit from relay A to relay G and closes the circuit to relay F and the rotary line switch.

D is a slow-to-release relay which closes the circuit to "indicating" lamp on the dispatcher's board.

E is a slow-to-pull relay which closes the ground circuit from relay B through signal bank on rotary line switch to relay A^1 on the associated relay group and closes the circuit to the restoring bank of the rotary line switch.

F is a slow-to-pull relay which opens the circuit to the motor magnet after the ground impulse that operates the rotary line switch has been delivered.

G, H and I (in sequence, left to right across top) are pendulum type relays which time the operation of relays B, C and D respectively.

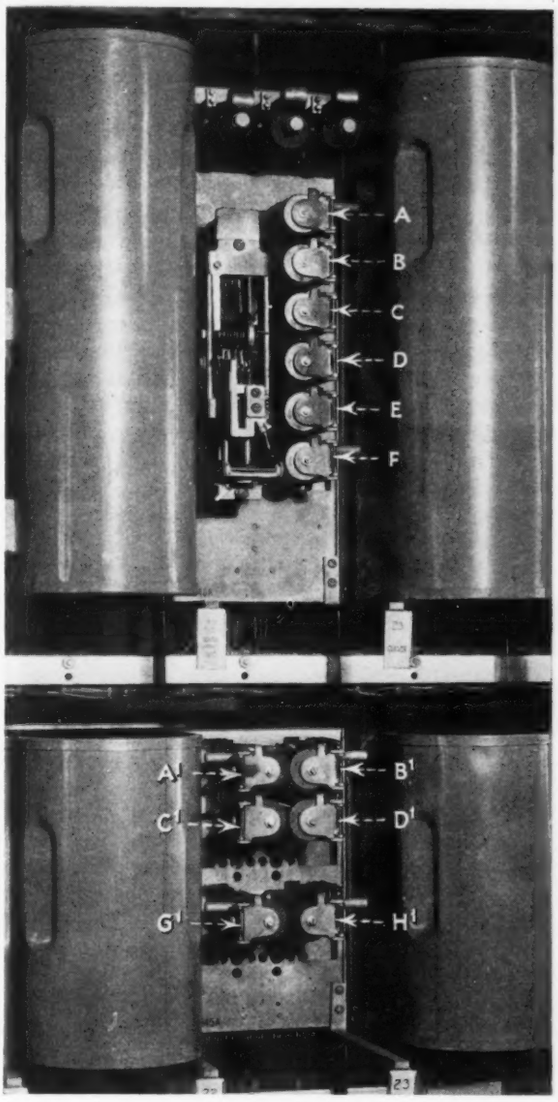
And J is a rotary type line switch, which selects the exchange or board desired, and after the lamp is brought in, restores to a neutral position ready for another signal. This line switch is capable of handling from one to 25 codes. The 1-microfarad condenser and 10-ohm resistance attached to the motor magnet is placed there to absorb the spark at the contacts of relay F and the motor magnet.

The "code" lamp that appears on the wire chief and dispatcher's boards gives a visible indication to the operators of the code ring that is being impressed upon the a.c. selector, allowing them to supervise all calls on the line whether intended for them or not.

The "trouble" lamp that appears on the wire chief's board gives a visible indication to the wire chief of any trouble on the a.c. selector; if any of the relays A, B, C or H are in an off normal position the "trouble" lamp will be brought in and remain permanent until the trouble is cleared or until the faulty selector has been replaced.

The "indicating" lamp on the dispatcher's board is made use of to inform the dispatcher of the approximate location of an abnormal condition on the transmission system. When an abnormal condition exists on the transmission system the induced voltage on the telephone line built jointly with the particular transmission line in trouble is usually sufficient momentarily to pull up the sensitive line relay which operates a part of the a.c. selector circuit, bringing in the "indicating" lamp on the dispatcher's board.

It should be pointed out that relays E, F, G, H and I are used to time the operation of other relays, lamps and the rotary line switch. When the circuit is in a normal position, ready to receive a call, relays A, B, E and G are energized.



the magneto line as the a.c. selector will operate from the usual type of magneto telephone or standard ringing machine.

Pendulum and slow relays with rotary switch

The a.c. selector consists of a series of pendulum type relays, slow-acting relays and a rotary type line switch, while the associated relay group consists of quick-acting relays. Each is made up in a compact unit having a metal dustproof cover and mounted in an Automatic Electric Company 240 switch trunk board. The a.c. selectors are mounted on the odd shelves and directly underneath on the even shelves are mounted the associated relay groups, each selector and its associated relay group being fused separately (see Fig. 1). These units are held in place by several notches in the switch frame slipping over a like number of posts on the trunk board, the circuit being completed through slip jacks located on the back of the switch frame and on the shelf of the trunk board (see Fig. 3). This method of mounting is very convenient and saves much time in case trouble develops in one of the circuits, as the unit in trouble may be lifted out and replaced with another one. The trouble may then be cleared at leisure.

The line relay is an alternating-current relay placed across the line in series with a condenser, operated by $16\frac{2}{3}$-cycle ringing current, and is mounted on a separate panel to guard against vibration, which sometimes causes this type of relay to chatter. The release of relay A (Figs. 2 and 3) is controlled through the break contact of the line relay, which assures a more reliable operation on weak signals.

Benefits Derived from Anti-Friction Bearings

By FRANCIS A. WESTBROOK
Center Conway, N. H.

EXPERIENCE of a number of widely diversified industries with anti-friction motors indicates that their inclusion in any plant-modernizing activities may become very profitable.

For instance, the Eberhard Faber Pencil Company had occasion to change from d.c. to a.c. operation at its Brooklyn plant some time ago. When it came to replacing the motors a change was made to ball bearings in place of the babbitted-sleeve bearings with which its old d.c. motors were equipped. There was an excellent opportunity to compare performance with the two types of bearings under similar operating conditions. With the old motors it was impossible to keep wood dust out of the bearings and equally impossible to prevent oil dripping where wood dust had accumulated, thus increasing the potential fire hazard which exists in a wood-working plant. As a result the plant electrician had to make very frequent rounds of all the motors. The bearings had to be drained and refilled approximately once a week and at least 35 times a year. To do this it was necessary to shut down the motors and much of the time this had to be done when the plant was not running and consequently involved overtime work. In spite of everything that could be done bearings burned out, or wore out, with the result that individual machines or groups of machines had to be shut down and production schedules interrupted. In addition to the cost of rebabbitting the bearing there would be losses due to idle time of the operators and various delays and annoyances interfering with the smooth operation of the plant. Because of the large quantities of lubricant used there were great possibilities of spilling oil on sawdust or floors, adding to the fire hazard, or accident hazard from slippery floors.

Benefits in wood-working field

After the ball-bearing motors were installed all of these conditions were radically changed. Bearing trouble practically disappeared so that the item of maintenance cost due to rebabbitting, shut-downs, etc., was eliminated. In addition there was a very substantial saving in lubrication expense. With the old sleeve-bearing motors, based on 35 changes of oil per year, it took about 2 gal. of oil and $5\frac{3}{4}$ man-hours per year per motor to keep them in shape. Reduced to dollars and cents that meant an expenditure of about $4.75 per motor per year, and as there are 125 motors in the plant the total was a real item of expense. The ball-bearing motors, on the other hand, require only $\frac{1}{2}$ lb. of grease per year, applied with a hand grease gun at six-month intervals without stopping the motor. The cost of doing this is about $0.18 per motor per year, so that the saving from this item alone amounts to well over $500 a year. To this must, of course, be added the advantages of freedom from interruptions in service, elimination of the cost of making repairs to sleeve bearings and the general simplification of routine and freedom from emergency repair work.

Another example is afforded by the Star Box & Lumber Company, Inc., of New York City, which replaced a single motor driving a grinder. The motor is practically always covered with fine sawdust and is consequently running under very adverse conditions. However, on account of the tightness of the bearings against leakage of lubricant and the entrance of foreign matter it runs satisfactorily with almost no attention. It is greased about once in two years. Other sleeve-bearing motors in the same plant need constant attention and in spite of it fail every once in a while, with the usual expense and annoyance resulting from such mishaps.

Steel company finds other advantages

The Sloss-Sheffield Steel & Iron Company, Birmingham, Ala., adopted ball and roller bearings for a wide variety of motor applications because of the advantage which they made possible. For instance, they have been particularly applicable to portable sinking pump motors, some of which operate at angles of 40 deg. from a horizontal position. The bearings carry the weight without unequal wear and do not leak oil. Ball bearings are also used to take the thrust in centrifugal pumps working against heads of 500 to 600 ft. Another interesting application of ball bearings is for the swivel bases of the trolleys of mine locomotives. They have permitted the trolley to follow the turns and unevenness of the trolley wires, so that the tendency for it to jump off has been materially decreased and much damage to equipment avoided.

Perhaps the most important application of ball bearings by this company is on the mine locomotive motors. The primary considerations in this case were not savings in power, increased bearing life or reduction in cost of lubrication, although these advantages are present, but rather to reduce the electrical maintenance of the motor itself. The locomotives operate on direct current. With sleeve bearings the leakage of oil onto the commutator bars and the windings was a serious cause of trouble. Oil on the commutators caused sparking and rapid deterioration of the bars and brushes. On the windings it caused deterioration of the insulation. By using ball bearings for the motors of locomotives up to 12 tons capacity and roller bearings for those of larger capacity these troubles have been eliminated, despite the swaying and vibration to which the locomotives are subjected and which formerly aggravated the spilling of oil and caused the oil rings to catch. Grease-gun lubrication is employed for the new bearings only once a month. The result has been that the intervals between overhauling have been increased by some 50 per cent. In addition, it is estimated by the management that there is a saving of 75 per cent in cost of lubricating. The practice of

greasing once a month is probably more frequent than is really necessary, but it was adopted because, unless some definite interval were prescribed, there would be danger of delaying the greasing too long.

Used on important power plant auxiliaries

Finally, let us consider the use of ball-bearing motors in the power plant field, where continuity of operation is a prime requisite. At the Westport steam station of the Consolidated Gas, Electric Light & Power Company, Baltimore, plain-bearing motors have been replaced with ball-bearing motors for such drives as stokers, revolving screens, centrifugal pumps, hot-well pumps, boiler-feed pumps and circulating pumps. Comparative tests of the two types of motors were made under similar conditions and numerous interesting facts brought to light. In some cases it was found that the starting current for ball-bearing motors was 50 per cent less than for plain-bearing motors, which made it possible on some of the stoker installations, for example, to use motors of one-third lower rating. The decreased friction losses, furthermore, mean lower no-load losses and also less temperature rise.

With the old motors about 85 per cent of all motor repairs were caused by bearing trouble. It was impossible to prevent foreign material such as coaldust, cinder grit, water and dirt from gaining entrance and it either caused serious wear or complete failure before the wear could be discovered. Not infrequently the wear or failure of the plain bearings permitted the rotor to come in contact with the stator and cause serious damage unless immediately discovered. In addition, the oil from the plain bearings found its way onto the commutators of the numerous direct-current motors used in this plant and resulted in damage as already explained in the case of the mine locomotives. All of these difficulties have been completely overcome by the use of ball-bearing motors.

Another interesting and sometimes important advantage of ball-bearing motors over those with plain bearings is that the former are shorter and take up less floor space. In one case the Baltimore power company had to install 30-in. pumps requiring two motors in a very congested space. It was found that with ball-bearing equipped motors this machinery required only 17½ ft., whereas only one pump and one motor with plain bearings needed 16 ft.

Ball bearings of the self-aligning type were found to be very desirable, because, although precaution is taken to line up the machinery with great accuracy, slight misalignment is sometimes almost impossible to avoid due to the warping of castings, inaccurate machining, etc. There is also frequently a deflection in the shafting which causes the ends of plain bearings to wear. In reassembling motors the end-bells may be easily bolted in place at a slight angle, or the break between the end-bell and the motor frame may be ridged somewhat, all of which result in some misalignment. Such misalignments are liable to cause the ultimate failure of plain bearings, but by using self-alignment ball bearings these possibilities of trouble may be entirely avoided.

In other words, where continuity of service is of importance, and there are few cases where it is not, careful attention should be paid to the proper selection of motor bearings. The design of anti-friction bearings is a highly technical and specialized proposition, and as there are several first-class manufacturers of this equipment who employ engineers qualified to give sound advice on application it would be advisable to consult them when this question comes up.

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Temporary High-Voltage Take-off Uses Only Four Poles

Extra line material available at nominal cost was effectively used in the construction of the Cabot switching station of the Turners Falls Power & Electric Company, in Massachusetts, to provide take-off structures for two outgoing 69-kv. circuits temporarily located at the end of the switch yard. A symmetrical bus layout (ELECTRICAL WORLD, December 31, 1932, page 884) features the design of this outdoor station, so that in the future 115-kv. circuits may replace the 69-kv. circuits leaving that section of Cabot, making the installation all 115 kv. if desired. The temporary take-off for each 69-kv. circuit consists of four wooden poles forming two simple

Minimum material used in this 69-kv. take-off

A-frames tied together by steel angles at the top and a short distance down, horizontal angle framing being used to carry a disconnecting switch in each phase and the necessary post-type insulators. By providing an extension frame at the top of the poles the strain insulators at which the first span of the line terminates are firmly fastened with the proper spacing between live conductors and parts. Short wire taps connect the horizontal 2-in. copper tubular buses looping around the end of the yard to the air-break switches.

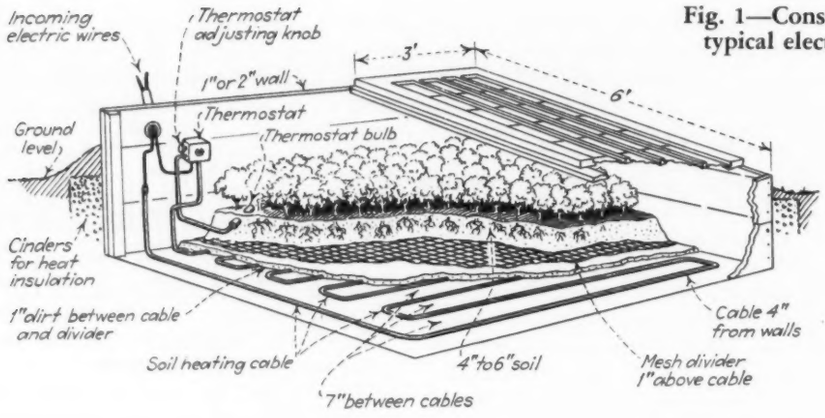


Fig. 1—Construction of typical electric hotbed

Soil Heating—A Load Builder

By G. A. REITZ
Rural Electrification Section, General Electric Company

ELECTRIC soil heating has become a real central-station load. The electrical method passed through the major experimental stage three years ago, and now almost 5,000 kw. of soil-heating equipment, representing about 4,000,000 kw.-hr. in annual consumption, has been installed. This is a load of 100 per cent power factor, most of the demand coming at night and on standard electric rates. It is the kind of load that utilities like.

Commercial truck gardeners, florists, etc., have for years been growing their crops out of season to get the highest prices and to supply products somewhere near the year around. In addition, many individuals have operated their own sources of off-season production. These practices have brought into common usage greenhouses, hotbeds, cold frames, germinators, etc., with necessary boilers, manure pits, etc. Manure has become a scarce and high-priced heat source in most sections. Along with this, none of the heat sources was easily controlled or operated. Therefore attempts to put electricity to the task of nursing and guarding tender plant growth were started several years ago.

Results were so far above expectation and costs so reasonable that, with the appearance of specially designed heating cable and thermostats, growers have adopted electric soil heating in an enthusiastic way.

The special soil heating cable consists of No. 19 nickel chromium wire covered with felted asbestos, cambric and lead. It has an over-all diameter of slightly less than $\frac{1}{4}$ in. and is so flexible it can be laid easily in any shape. The cable should be used in unit lengths of 60 ft. on 115 volts or 120 ft. on 230 volts, giving 400 and 800 watts respectively.

A knob extending outside the thermostat case can be turned to raise or lower the temperature setting for any point from 30 to 100 deg. F. (60 deg. is the most common hotbed temperature). A sensitive bulb on the end of an 18-in. capillary tube is put into the medium to be controlled—the soil, the air, or a combination of the two. The thermostat has a capacity of 25 amp. on either 115 or 230 volts a.c.

The cable is usually buried in the soil about 5 or 6 inches, though it can be in the air or in any convenient location. A 60-ft. length on 115 volts will handle up to 36 sq.ft. of soil (two sashes); a 120-ft. piece on 230 volts or two 60-ft. pieces in parallel on 115 volts will handle up to 72 sq.ft. in hotbed soil. The thermostat is connected in series and has electrical capacity to handle six circuits of either 60 ft. each on 115 volts a.c. (216 sq.ft.) or 120 ft. each on 230 volts a.c. (432 sq.ft.). With this method of generating and controlling the heat right in the soil where desired it is used efficiently and provides controlled growth of plants.

Some growers have operated without a thermostat to control the temperature, thereby losing some advantages of electric soil heating. An unbiased college investigator reports: "Automatic control of soil heat is, of course, ideal, but not absolutely necessary. In spite of the apparent first cost, automatic (thermostatic) control is undoubtedly cheaper in the end."

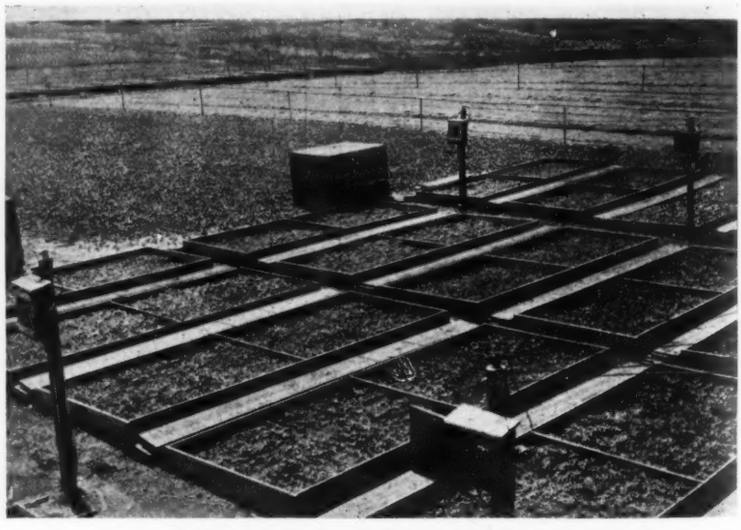
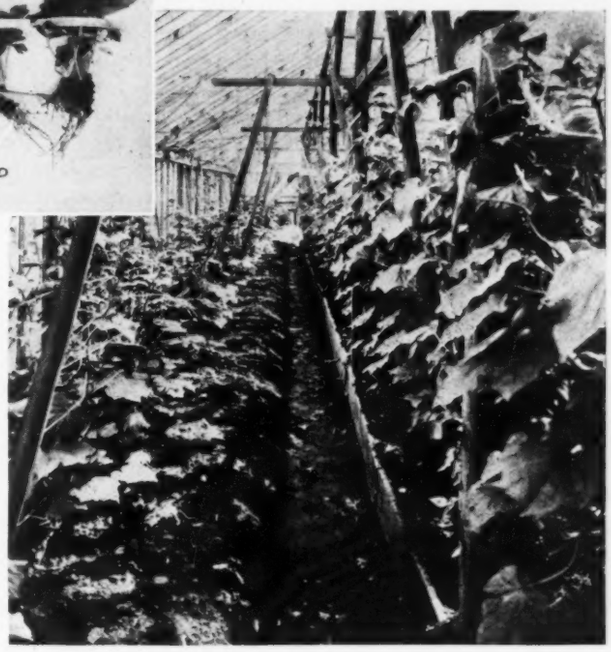


Fig. 2—A group of 24 electrically-heated hotbeds

Top—Celery on a Montana farm after 26 days growing. Below—Cucumbers 1½ months after planting. Those at right received electric soil heating and were ready for market one month earlier than those at left.



Comparative results with and without heated soil

Central-station companies in various parts of the country have carried on active campaigns to introduce soil heating in their territories and all report receptive markets.

New York Power & Light Corporation, one of the early promoters of this type of load, in the spring of 1931 built four hotbeds and furnished current in order to test out, under practical operating conditions, several types of hotbeds which were then being advocated. The work was done in co-operation with the Albany County Market Gardeners Association and the Albany and Schenectady Farm Bureaus. The growers were so well satisfied with the results that the utility prepared and sent to the growers printed folders on the subject. Rural service representatives have disposed of some 15,000 ft. of soil-heating cable, giving an estimated load in excess of 100 kw. and using about 75,000 kw.-hr. annually.

Results of Soil Heating in Cleveland Area

Case 1—A greenhouse used 60 ft. of cable in a propagating bench, maintaining a soil temperature of 60 deg. F. and air temperature of from 40 to 55 deg. F. Out of the first batch of dahlia cuttings (twenty in number) none failed to root; old methods usually yielded approximately 70 per cent. A variety of carnation that formerly rooted about 30 per cent is now rooting close to 100 per cent. The savings on dahlias:

Six additional dahlia plants, value $3 to $10 each (average at $5), total	$30.00
Cost of electric heat, including heat for some tubers	4.00
Added profit	$26.00

Case 2—A greenhouse used 120 ft. of cable in propagating benches and plant seed house. Coleus are rooted in about one-third the time formerly required. With electric heat approximately 6,000 plants are grown in the same area and in the same time as that required previously by 2,000 plants. The results for coleus:

Additional 4,000 plants at $10 per 1,000	$40.00
Cost of electric heat	3.60
Added profit	$36.40

Case 3—A greenhouse used 60 ft. of cable in propagating bench, with an air temperature of 60 deg. F. and soil temperature of 60 to 65 deg., growing geraniums from slips. Geranium slips were rooted in seven days, saving two-thirds of the normal time. Because of rapid rooting, an extra cutting could be obtained from the new geranium plant, and this new cutting made to root for the same market. The results:

Value of second cutting	$30.00
Value of plants formerly lost by not rooting	7.50
Cost of electric heat	2.00
Added profit	$35.50

Case 4—In another greenhouse, in which 60 ft. of cable was used in a dahlia-propagating bench, it was necessary to transplant 35 dahlia seedlings from contaminated soil when two weeks old (the plants usually are not disturbed until three months old). The seedlings continued to grow successfully, with no loss. The former loss of 20 to 30 per cent in dahlia cuttings, which vary between $3 and $10 each in value, has been eliminated. No loss in plants occurred in the electric bed during a cold snap when the air temperature of the greenhouse dropped to freezing. The results:

Value of seedlings, $4.25 per dozen, total	$12.50
Cost of electric heat	5.09
Added profit	$7.41

Case 5—A greenhouse using 840 ft. of cable in plant seed beds, covered with hotbed sash, used no heat in the greenhouse in growing tomato plants. The growing time of the plants was reduced more than one-third, and 6,000 plants per ounce of seed, compared with 4,000 plants per ounce previously, were obtained. The installation had practically no supervision during the germination period. The sashes were left off during the night on several occasions and no provision was made to insulate the heated section from the unheated section. The results:

Savings in seeds for 18,000 plants	$4.00
Saving in cost of coal, 10 tons	25.00
Cost of electric heat	13.16
Added profit	$15.84

Case 6—For growing annuals for the market, 180 ft. of cable is installed in hotbeds. To raise annual plants to salable size ready to transplant required $4.12 worth of electricity, as compared to $12 for manure at $2 per load.

Case 7—A greenhouse is using soil heating cable in ten benches, each 60x5 ft., for growing roses for the cut flower market. Production has been increased one bloom per plant per month; last March there were 2,500 more blooms than in March of 1932. It was possible to reduce the greenhouse air temperature from 80 to approximately 60 deg., the soil temperature is kept between 65 and 70 deg., and the grower is able to vary at will the air and soil temperatures, enabling him to speed up or hold back the development of blooms. The results:

Additional income from blooms, $2 per dozen	$416.00
Saving in coal, 20 tons	50.00
Cost of electric heat	37.86
Added profit	$428.14

Pacific Gas & Electric Company undertook active promotion of soil-heating cable in 1932. Salesmen, expected to contact nurserymen, truck gardeners, home owners and flower enthusiasts, were first instructed in detail about hotbeds through a rural electric short course held at the University of California. A commission of $10 for each soil-heating installation, irrespective of size, was set up in the sales plan. Salesmen frequently sold their sample kits and helped with the installations. Seventy installations, of about 60 kw. in total capacity, were made in 1932, and 65 additional jobs, with a connected load approaching 100 kw., have been made so far in 1933. A sales bulletin has been prepared, including pictures of installations, descriptions of particular installations in that territory and an enumeration of plants being raised in electric hotbeds.

Union Electric Light & Power Company has laid out a definite plan of dealer co-operation and has electrical dealers prepared to make installations. Tours, exhibits and publicity of a co-operative nature are carried on among rural customers and hotbed users, as counted by meter readers, have been circularized with literature.

Customers of the Alabama Power Company have used electric heating cable for heating the soil in greenhouses, cold frames and hotbeds for the past three years with satisfactory results. The observations of the company lead to the belief that electric soil heating will prove to be one of the most profitable uses of electricity in agriculture.

Oklahoma Gas & Electric Company reports that of the many installations that have been made in its territory it knows of no instance where use of the equipment has ever been discontinued.

Scattered throughout the territory served by the Northern States Power Company there were about 25 installations of soil-heating cable in operation last spring, the majority in hotbeds. It is expected that several of these installations will have been increased in size and the number of installations doubled before next spring.

Puget Sound Power & Light Company has installed more than 20,000 ft. of soil-heating cable in the past two years. One user, who originally installed four 60-ft. lengths, has since then put fifteen additional lengths in his greenhouse. The utility has not sold soil-heating equipment directly, but its farm electrification men have given promotional and operating service to hotbed operators and the cable has been sold by dealers. Dealers were not at first interested in soil heating because they knew nothing about it, so the power company installed several demonstrations in greenhouses at its own expense.

Approximately 20,000 ft. of soil-heating cable, or 133 kw., has been installed in the Cleveland area so far this year. A number of cases cited on page 763 are to show how yields are increased and costs decreased.

In addition to the above cases, all in the Cleveland district, there are plenty of similar reports of better yields, decreased costs and added incomes from all types of applications and in all sections of the country. Perhaps one as interesting as any is that of H. S. Leong, market gardener, of Vancouver, B. C. As an experiment he divided one of his greenhouses in half longitudinally, installed soil-heating cable in one half and prepared the other half in the usual manner. In each half 132 cucumber plants were planted. One and a half months after planting the ones without electric heat were 3 ft. high and not bearing and the heated plants were 6 ft. high and bearing. The soil-heated plants produced 400 dozen cucumbers, which, because they were on the market a month earlier than usual, brought an average price $1 per dozen higher ($3.50 per dozen instead of $2.50). Mr. Leong thus obtained an added profit of $400, with a power cost of less than $30. In addition there was a saving in the fuel bill since he was able to run the greenhouse at a temperature 10 deg. below normal.

Results of the many installations of soil-heating cable have been so far above expectation and the costs so reasonable that growers have adopted the heat in an enthusiastic way. The time is approaching when those gardeners and florists not using electricity will be handicapped in competitive marketing.

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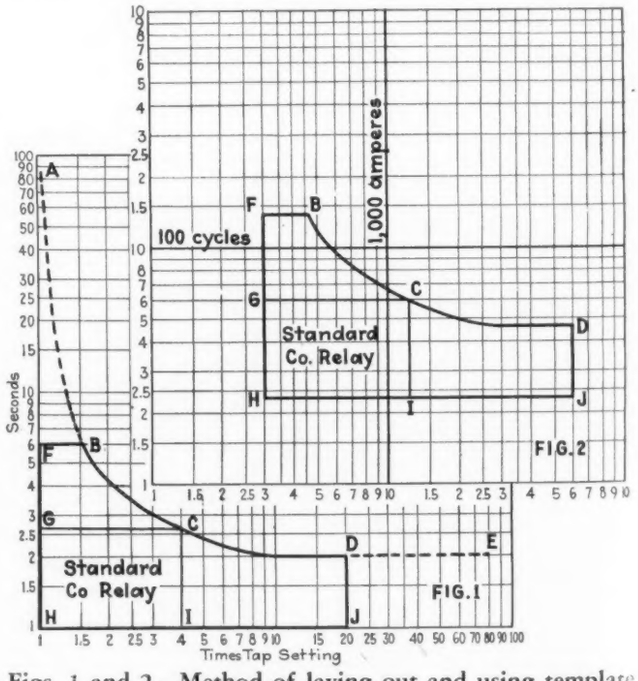
Templates of Relay Curves Aid Checking Selectivity

By J. H. NEHER
Engineering Department, Philadelphia Electric Company

The checking of relay selectivity by comparing their characteristic curves when plotted on a common current basis is a laborious method if the curves must be reproduced by the usual point-by-point method of plotting. Considerable time and labor may be saved by drawing the curves on two-cycle log-log paper by means of templates prepared for each relay type. The horizontal movement of the template on the graph paper adjusts the current scale and the vertical movement adjusts the time scale. The action is the same as that of a slide rule.

Fig. 1 illustrates the method employed in preparing a template. Curve *A–B–C–D–E* is the characteristic curve



Figs. 1 and 2—Method of laying out and using template for reproducing relay characteristics on comparable basis

of a standard CO relay, No. 10 lever setting, plotted on log-log paper. The template *F–B–D–J–H* is drawn so that the curve *B–C–D* covers the working range of the relay and the left-hand edge *F–H* corresponds to the starting current. For convenience the template is traced on heavy celluloid and accurately cut out. The vertical line *I–C* is located at the current at which the relay calibration is to be given (in this case 400 per cent of tap setting), and this line, together with the horizontal line *C–G*, is scratched on the template.

The procedure for drawing the characteristic curve of this relay set to start at 300 amp. and timed at 60 cycles at 400 per cent of tap setting is illustrated in Fig. 2. The center vertical line of the graph paper is arbitrarily marked 1,000 amp. and the center horizontal line 100 cycles. The template is placed on the paper so that its left-hand edge *F–H* lies on the 300-amp. line and the horizontal line *C–G* lies over the 60-cycle line. A pencil or ruling pen is then drawn along the curve *B–C–D*, which is the characteristic curve of the given relay at the given setting.

Use of a single template for each relay type presupposes that the characteristics at various time lever positions are proportional. This assumption is sufficiently accurate for most purposes, provided the template is made at the highest lever setting. Greater accuracy can of course be obtained by making a second template for use at low lever positions.

A similar procedure can be followed in making templates for fuse characteristics, but the range of fuse sizes of a given make which can be handled with a single template is somewhat limited. A horizontal line drawn on the template at 60 cycles (or any other convenient value) serves to fix the vertical position of the template.

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Removing Popular Misunderstandings

In the December 2 issue of ELECTRICAL WORLD were presented the answers which Samuel Ferguson, president of the Hartford Electric Light Company, has given to some popular criticisms of utilities. Following are other comments. They suggest the way in which other utilities can meet the criticisms which grow out of misunderstanding, although each company will have to adapt its replies to local conditions.

Q. You exert your arbitrary power of cut-off to enforce collections from those who can't pay on account of unemployment conditions.

A. Under normal conditions it is in the interest of our customers that we should insist on payment because all uncollectible accounts add to our expense of doing business and have to be covered in the rates charged to all.

But under present abnormal conditions we are carrying thousands of customers who pay nothing, or only small amounts. In the long run our other customers will not suffer, as the good will so created will mean more business later, which in time will reduce costs, and reduced costs always mean with us reduced rates to the public.

Our policy of not cutting out for non-payment does not mean that customers can just let their accounts run and do nothing about it. We insist that they pay attention to the monthly bills and come in and tell us when they cannot pay the full amount. This is not too much to ask, and as a result the situation which might easily develop into a racket is kept well in hand. In brief, our policy is this: If you cannot pay, come in and tell us the sad story. We will find some way to keep service going, but if any one cannot pay, and will not even take the trouble to tell us about it, the cut-out man will be around, as we have no other way of knowing that the customer is not just trying to "do" us when he is perfectly able to pay.

It strengthens one's belief in the general honesty of the public to see people even now coming in and paying us amounts for which we gave them credit certificates six months or a year ago. And the gratitude expressed makes one feel good at being able to give a helping hand in time of need.

Q. Can you justify a minimum charge which customers must pay although they use no current? Isn't it having a monopoly in a community that makes it possible?

A. The question was recently raised at a meeting of Connecticut property owners, when a member stated that he was not only billed a minimum charge of $1 for no usage, but a 3 per cent tax on it as well. He cured the situation by ordering out the meter, which was the proper thing to do. Meters are expensive pieces of apparatus; also, it costs money to read, test and maintain them. If a customer insists on retaining it, the law does not permit us to refuse; but we can and do make the condition that in return he give us a dollar's worth of business. This seems a fair stipulation, as otherwise every vacant apartment, store and house in the city would insist on having the meter left in, and our costs, on which our rates are based, would be increased thereby.

We are not looking for the occasional revenue we receive for this $1 minimum requirement (that makes no difference at all), but what it does (and this is important) is to stop an expensive leak which would otherwise be large. This is only one of the many leaks which can only be stopped by rules which, in general, are equitable and work well, but which in occasional instances create a hardship or annoyance which we much regret.

Q. Why should a company be entitled to a return on the total of stocks, bonds, premiums, surplus and reserve?

A. The answer is that it is not entitled to any given return by reason of the total of these liabilities. The judgment of the state commission as to what earnings are reasonable is final so long as the return fixed is not so low as to amount to a confiscation of the company's property. The commission can use any yardstick it wishes in determining what is reasonable, but its decision is subject to appeal in the courts in the event that the return allowed on the value of the property is so unreasonably small as to amount to confiscation.

The liability items listed in the question are, under the Supreme Court decisions, only one out of several factors which must be considered in determining value; the principal of these are concerned with the inventory of all existing property and its condition. In other words, "value of property" is not to be determined by the liabilities of the company, but by its assets.

The company is owner of all assets and devotes these to its service, and it makes no difference whether these are bought with money furnished directly by stockholders or by earnings which belong to them but which were previously plowed into the property instead of being distributed as dividends.

Sometimes a question is raised as to the propriety of including assets in which the replacement reserve fund is invested because this money is earmarked for a particular eventual purpose. If, however, the reserve were kept in cash and the assets provided out of new money borrowed for the purpose, there could be no question of propriety, and what possible difference can it make whether the necessary money is borrowed from the replacement fund or elsewhere? Of course, the replacement fund should be credited with the same interest that it could earn if kept on deposit subject to instant call, and thus reduce the otherwise necessary annual accruals.

The company borrows from the retirement fund on call in the interest of its stockholders, and they are responsible for returning it at once whenever it is needed for replacements. Money loaned under these conditions is entitled only to low rates of interest and the stockholders are entitled to whatever reasonable profits they can make with it after payment of that interest.

(Continued on next page)

Q. Why do not our legislators favor a change in tax laws that would remove the public utility companies from the favorable position which they hold under the present tax set-up?

A. Do you really believe that our tax position is favorable? I only wish it were. Taxes are the greatest single obstacle to material rate reductions. Every one should know as well as I that the only dollars we have with which to pay taxes are the ones given us in payment of monthly bills, and believe me, the tax collector is after those dollars good and plenty. But it is not the company which suffers; it is our customers who do the suffering, as we have to collect from them in every bill almost 20 per cent more than we would otherwise have to collect to cover the cost of service, including our stockholders' wages.

In other words, every time our customers pay us a dollar they receive approximately 85 cents worth of electric service and a 15-cent tax bill. Do you know of any other business that has to hand over 15 per cent of its gross receipts? I do not. And I see no prospect of relief except through the influence of the public when roused in bringing home to federal, state and municipal authorities the idea that their re-election depends on how much they reduce expenditures, not how much they spend. Defeat the spenders a few times and the politicians will right-about-face, just as they have done when they realized that their jobs did not depend on continuing to vote dry. Get back to reasonable budgets and the tax load will be wonderfully lightened. I will back every effort to get back to normal budgets, but we will not succeed until the politicians learn that the spenders will not get the votes.

Q. Prices in Massachusetts municipal plants are only one-half what you pay in Hartford.

A. This statement was made in a public meeting a few weeks ago. I do not know all the municipal prices in Massachusetts, but let's compare Holyoke, which has a reputation for lowness. For the bulk of our customers the comparison is as follows:

For 70 kw.-hr. (the average use of our customers) the price in Holyoke is $3.50 less a prompt payment discount of 20 per cent or $2.80 net to the company.

In Hartford the price is $3.10 for this usage, but without the prompt payment discount.

But remember the taxes which the people of Holyoke do not have to pay in their electric bills, but which have to be included in the Hartford bills at the rate of 15 cents of tax for each 85 cents worth of electricity.

The difference, then, between Holyoke and Hartford is that in Holyoke they give back 20 per cent as a prompt payment discount, while in Hartford we have to turn over the corresponding item to the tax collector for an indirect instead of a direct gain to the public, with this comparative result:

Holyoke .....$3.50 less 20%, or $2.80 net to the company
Hartford .....$3.10 less 15%, or $2.63 net to the company

Now suppose that these customers should use an additional 50 kw.-hr. Let us look at the price for this 50 kw.-hr. In Holyoke the price would be $2.50 less 20 per cent for prompt payment, or $2 net. In Hartford the price would be only $1.50, and as before, 15 per cent of this $1.50 we would have to pass over to the tax collector.

So even with the burden of taxes we are doing the better job.

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READERS' FORUM

"Juice for the Gander"

To the Editor of the ELECTRICAL WORLD:

In your November 11, 1933, issue you have an article bearing the headline "Wyman Development Arrests Steam Generation," a rather startling headline in the face of your recent editorials criticising government development of water power. Now, I am in favor of criticism, even unfair criticism is better than no criticism at all. When a manufacturer brings out a new article he generally encounters criticism from the competition. But other engineering undertakings are seldom subjected to criticism. A new development is put through, those who are responsible for it proclaim it as the greatest contribution to engineering economy, and that's the end of it, even if it is ridiculously uneconomical. Since you have recently established a precedent in criticising government engineering undertaking, it would only be fair for you to admit that what is sauce for the goose is juice for the gander. Now, how does this particular hydro "arrest" steam generation? The present cost for 48,000 kw. is given as $15,923,701, or say $16,000,000, not including the transmission line, or $300 per kilowatt. The fixed charges alone at a conservatively low estimate of 12 per cent would thus be $40 per kilowatt per annum.

It is stated that the ultimate 72,000 kw. would generate 280,000,000 kw.-hr. per annum, or about 4,000 kw.-hr. per kilowatt. On this basis the fixed charges, exclusive of transmission line, would be 9 mills per kilowatt-hour. Add line losses and fixed charges on the line and you get well over one cent per kilowatt-hour. Any steam plant that cannot generate for 5 mills is not worth its salt. A modern plant can generate for 3 mills or less at this high plant factor. So how does that arrest steam generation?

M. M. SAMUELS.

302 W. 90th Street,
New York City.

Having published editorials on the greater economy of steam plants at or near load centers compared with expensive hydro plants requiring long transmission lines and steam back-up, and then presented articles like the one criticised, in which we point out that, for economy, utilities have shifted their generation to water power, it is not surprising that any one should consider us inconsistent. But the paradox exists that both can be true. The reason is that, in the first case, reference is made to the economics of developing a generating system, while in the second case the investment has already been made in hydro and steam plants and the economies refer to load allocation. It is the failure to distinguish between these two situations that causes apparent conflicts in conclusions.

To illustrate this point we are willing to accept in principle the brief analysis of the relative costs of hydro and steam power made by Mr. Samuels, if the purpose is to determine which should be developed.

But when it comes to utilizing an existing investment most economically the situation differs as follows: The investment in both hydro and steam plants, including transmission lines, has been made and the fixed charges continue regardless of which plants are operated. The only place to save money is on operating expenses. In hydro plants the operating expense due to production of power is very small. Compared with this the operating expense of steam plants is high, as fuel constitutes a large item, and labor is usually greater for steam plants than hydro.

Hence in effecting system operating economy it is chiefly a problem of allocating generation to the plants having the lowest unit operating expenses, making due allowance for transmission losses. In the cases where load has been shifted from steam to hydro it has been due to the fact that the unit operating costs of the latter, allowing for transmission losses, have been less than for steam generation, as fuel cost and labor expense are reduced. The fixed charges on the two types of plants do not have to be considered in load allocation, because they continue anyway.

Therefore, while exceptions do occur, it is not inconsistent to conclude that it is more economical to build steam plants close to load centers than to build hydro plants, requiring long transmission lines and steam reserve, and at the same time say that system economies have been effected by shifting loads to existing hydro plants or that steam generation has been temporarily arrested—EDITORS.

Men of the Industry

C. W. Hough Appointed to Vice-Presidency in New York

Clinton W. Hough, who has been connected with the North American Company since 1921, has been elected a vice-president of that company. Mr. Hough in the course of his career has had extensive engineering experience in this country and also abroad. His first connection was with a small electric plant in Boonville, N. Y., his native city. In 1900 he joined the operating division of the Utica Light & Power Company and during the next few years he was associated with the General Electric Company in the construction of the power facilities for a street railway in Joliet, Ill., and an interurban line connecting Aurora, Elgin and Chicago. In 1904 he went to Kansas City in connection with the building of a power plant and substations for the Metropolitan Street Railway Company and the Kansas City Electric Light & Power Company. Two years later he became general manager of the Consolidated Light, Power & Ice Company of Joplin, Mo., and subsequently joined the Electrical Securities Corporation and was appointed general manager of the Consolidated Power & Light Company of Deadwood, S. D.

In 1912 Mr. Hough went to London for J. G. White & Company, Ltd., and for nine years, as joint manager of its operating department and officer and director of various utility companies, he assisted in the operation and management of electric properties under the White management in South America, Mexico and Australia. Returning from London in 1921, he joined the North American Company and for a number of years was a director of that company. He is also a director of North American Edison Company and president and director of Wired Radio, Inc., a subsidiary of the North American Company.

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DR. FRANK CONRAD, assistant chief engineer of the Westinghouse Electric & Manufacturing Company, was recently awarded the John Scott medal for scientific achievements by the city of Philadelphia. Dr. Conrad has been honored previously for his achievements in radio. In 1928 the University of Pittsburgh honored him with the degree of doctor of science and in 1930 he was the recipient of the Edison medal of the American Institute of Electrical Engineers for his contribution to radio broadcasting and short-wave radio transmission. Earlier, to be exact, in 1925, he was awarded the Morris Liebmann memorial prize of the Institute of Radio Engineers for his early work in connection with high-frequency transmission.

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J. L. Stair New President of Illuminating Society

J. L. Stair, for many years chief engineer of Curtis Lighting, Inc., Chicago, has been elected president of the Illuminating Engineering Society. Mr. Stair has been an active factor in the promotion of correct lighting practices, especially with respect to the development of equipment and methods for what is commonly known as indirect

illumination. He has designed and patented many devices for scientific light control.

Following graduation from the University of Illinois, Mr. Stair was employed for three years as a designer of electrical apparatus with George P. Nichols & Brother of Chicago, whose activities are chiefly devoted to the equipping of lift bridges and draw bridges with electrical machinery. He became active in the lighting field by becoming associated with the National X-Ray Reflector Company, now Curtis Lighting, first as sales engineer, then as head of the direct lighting division, and finally as chief engineer and head of the educational activities of the company.

For many years Mr. Stair has been an active member of the I.E.S., having served as chairman of the Chicago section, of the papers committee, and of the sustaining membership committee and as a member of various other committees. He has taken a prominent part in the committee work of the International Congress on Illumination and contributed much as a member of committees of the commercial and industrial lighting section of the National Electric Light Association. He served as a member of the advisory committee on illumination for the Chicago Exposition and as a member of the National Safety Council subcommittee on illuminating engineering for the Fair.

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H. MORRIS KELLEY, vice-president of the Lynn Gas & Electric Company, Lynn, Mass., has been elected president of that utility, succeeding the late M. P. Clough.

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SALVATORE CASTAGNOLA, formerly advertising manager of the Lionel Corporation, New York, maker of Lionel electric trains and model railroad equipment, including "multivolt" transformers, has been elected vice-president in charge of all sales and sales promotion activity.

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HAROLD S. BROADBENT, who has been connected with the Westinghouse Lamp Company since 1921, has been appointed manager of the commercial engineering department of that organization. He first served as a lamp development engineer and four years later was transferred to the commercial engineering department to supervise all policies of lamp design.

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PERCY S. YOUNG, vice-president in charge of finance of the Public Service Corporation of New Jersey and subsidiary companies, was elected vice-president of the American Gas Association at the annual convention of the association held recently in Chicago. Mr. Young has long been active in the work of the association and was a member of its board of directors.

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CYRUS W. KOINER, manager of the Redondo Beach, Calif., district of the Southern California Edison Company, Ltd., has been appointed city manager of Pasadena to succeed John W. Charleville, who resigned December 1. Mr. Koiner previously served the city in that same capacity for a period of four years from 1921 to 1925. He was manager of the municipal light and power department for many years prior to occupying the position of city manager. After he resigned from the latter office in 1925 he engaged in private engineering practice for a short time, becoming manager of the Edison company's Redondo Beach district in 1927.

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T. C. CLARKE has been appointed district manager of the Northern Electric Company, Ltd., with headquarters at Vancouver, succeeding J. F. Little, who is retiring after 34 years of service with the company. Mr. Clarke

joined the Northern Electric Company in Vancouver in 1920 as power apparatus sales engineer, serving in this capacity up to the end of 1928. At that time he was transferred to Winnipeg as district sales manager, where he became president of the Manitoba Electric Association, holding that office until April of 1932, when he was transferred again to Vancouver as district sales manager for British Columbia.

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OBITUARY

HARRY L. DARRY, 55 years old, construction engineer for the Indiana & Michigan Electric Company for the past seventeen years, died recently at his home in South Bend, Ind.

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FRANK H. MILNE, superintendent of the Rockville, Conn., division of the Rockville-Willimantic Lighting Company, died November 19 at his home in Rockville. Mr. Milne, who was 57 years old, had been connected with the company for almost 40 years.

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TILLMAN D. LYNCH, aged 66, formerly consulting metallurgical engineer of the Westinghouse Electric & Manufacturing Company, died recently at his home in Edgewood, Pa., after several months illness. Mr. Lynch, who recently retired from active duties, was one of the best-known metallurgical engineers in the United States and a past-president of the American Society for Steel Treating.

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ARTHUR W. MIDDLETON, president of the Consolidated Telegraph & Electrical Subway Company, a subsidiary of the Consolidated Gas Company of New York, died November 15 at his home in Bay Shore, L. I. He was 66 years of age. For 44 years Mr. Middleton was associated with this company, which is the builder, owner and operator of underground conduits located in Manhattan and the Bronx which are used to carry high-tension electric light and power for public distribution.

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WILLIAM W. NIELSEN, formerly manager of the New Mexico Power Company, Santa Fe., and a past-president of the Rocky Mountain Division of the National Electric Light Association, committed suicide December 1 at his home in Santa Fe. He was 41 years of age. Born in Copenhagen, Denmark, Mr. Nielsen came to this country at an early age and attended Phillips Andover Academy and Colgate University. He was identified with the Federal Light & Traction Company at Springfield, Mo., and at Tucson, Ariz., before going to its New Mexico properties.

New Equipment Available

Oil-Blast Breakers for Pole or Framework

Outdoor oil-blast circuit breakers, designated as type FKO-127 and recommended for station and rural distribution service, have been announced by the General Electric Company. The breakers are of the rectangular-tank type and may be operated manually or electrically. The equipment is suitable for either pole or framework mounting. Despite their compactness, the breakers have liberal margins of safety, all ratings having been verified by complete tests.

Oil-blast action is obtained by the use of a horizontal baffle which divides the tank into a lower chamber, where the arcs are drawn, and an upper chamber, into which the oil and gases are discharged. As the contacts part arcs are drawn which build up sufficient pressure in the lower chamber to cause a blast of oil across the arc path to the upper chamber, the oil displacing the arc products and at a current zero introducing sufficient insulation to prevent the arm from re-establishing. These breakers are rated 400 and 600 amp. at 7,500 volts and have an interrupting ratio of 50,000 kva.

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Gear Motors Provide Speeds from 2 to 4,000 R.p.m.

To meet a constantly increasing demand for unit motor drives adaptable to a wide range of speeds otherwise out of the range of simple motor operation, Fairbanks-Morse & Company, Chicago, has developed a line of gear motors capable of providing speeds from 2 to 4,000 r.p.m. in capacity sizes from ¾ to 75 hp. Three separate types, known as the integral gear motor, the all-motor type gear motor and the gear-head type gear motor, have been produced to meet various requirements of application. The principal advantages of this type of construction are high unit efficiency, low cost, simple construction, saving in floor space, only a single support required, easy installation and practically noiseless operation.

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AN ELECTROLINE AUTOMATIC DEAD-END offering many advantages over other types of dead-end construction has been announced by the Electroline Company, Chicago. To dead-end the line it is only necessary to insert the wire into the automatic dead-end, no tools being required. The automatic dead-end is available in two types—series 3100 without tap connector and series 3200 with solderless tap connector.

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Vertical Drive Base for Correct Belt Tension

Vertical drives have been troublemakers because all belts stretch, and the resulting drop in belt tension then tends to make the belt fall away from the lower pulley, causing belt slip and loss of pulley speed. The vertical drive base recently announced by the Rockwood Manufacturing Company eliminates this trouble by providing for and maintaining correct belt tension on both pulleys. The force producing belt tension is derived from coiled springs. When the motor is located above the driven pulley the springs are adjusted to support the entire motor weight plus the necessary belt tension; when the motor is located below the driven pulley the springs are adjusted to support only that portion of the motor's weight not needed to provide belt tension.

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BUS EXPANSION JOINTS, designed to connect 4¼x4-in. vertical bars to 4¼x4-in. horizontal bars have been announced by the Delta-Star Electric Company, Chicago. The symmetrical square-shaped arrangement of the flexible laminations makes it possible to connect bars in the same plane or bars in planes at right angles to each other.

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THREE STREET-LIGHTING EQUIPMENT UNITS have been announced by the General Electric Company. A luminaire, with no external live parts, a 30-amp. switch for the control of multiple street-lighting circuits and a cutout equipped with a "Thyrite" by-pass are included.

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THE Z ALL-MOTOR TYPE which incorporates highly desirable features never before obtained in a motoreducer has been announced by the Falk Corporation, Milwaukee, Wis. It is compact and rigid and yet it allows the purchaser the utmost freedom in his choice of motor. An entirely standard horizontal type motor without any change whatever may be used, thus employing motors from a surplus stock if desired, this being particularly advantageous with explosion-proof and other motors which must be inspected and approved as separate units and must not later be altered.